



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

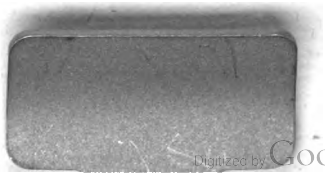
Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

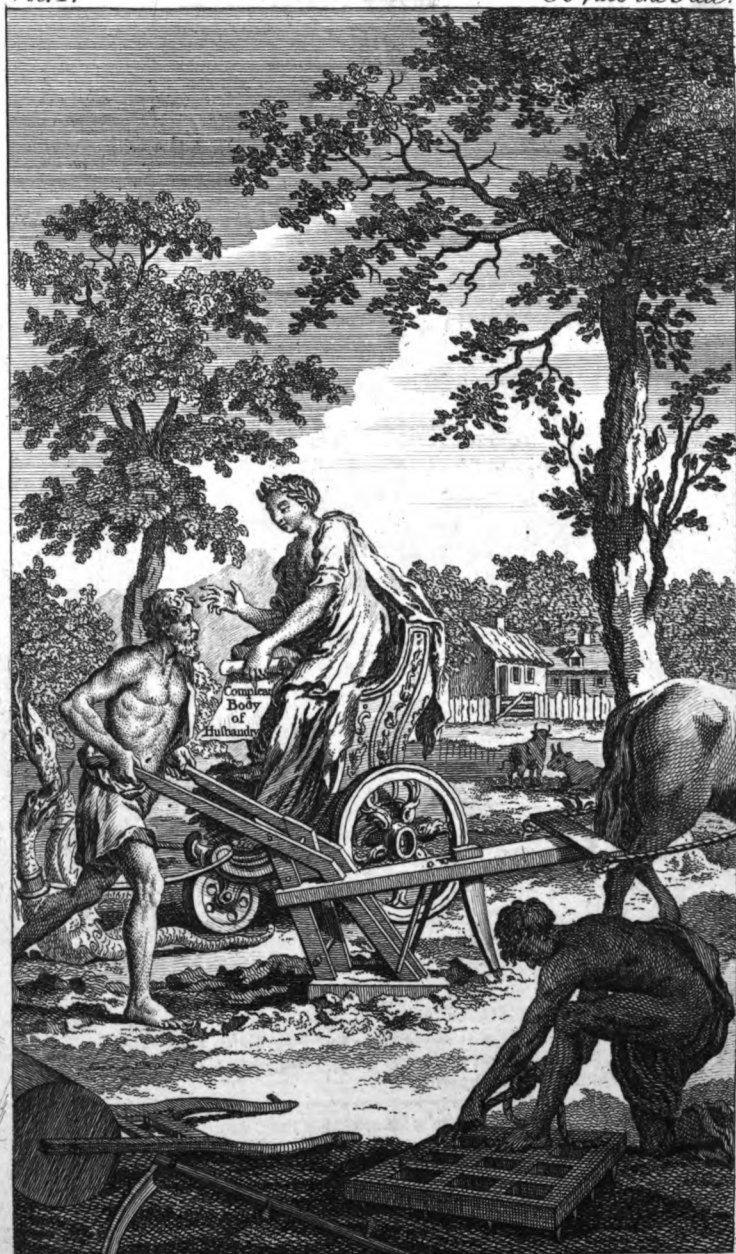
- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>







*The Goddess CERES in her Chariot drawn by Dragons,
Teaching MANKIND the Art of Husbandry.*

J. Myndes sc.

A
COMPLEAT BODY
OF
HUSBANDRY.

CONTAINING

RULES for performing, in the most profitable
Manner, the whole Business of the Farmer and
Country Gentleman,

IN

Cultivating, Planting and Stocking of Land;

Injudging of the several Kinds of *Seeds*, and of *Manures*; and
in the Management of *Arable* and *Pasture Grounds*:

TOGETHER WITH

The most approved Methods of Practice in the several
Branches of **HUSBANDRY**,

From sowing the **SEED**, to getting in the **CROP**; and in Breeding
and Preserving **CATTLE**, and Curing their **DISEASES**.

To which is annexed,

The whole Management of the **ORCHARD**, the
BREWHOUSE, and the **DAIRY**.

Compiled from the Original Papers of the late
THOMAS HALE, Esq;

And enlarged by many new and useful Communications on
Practical Subjects,

From the Collections of Col. **STEVENSON**, Mr. **RANDOLPH**,
Mr. **HAWKINS**, Mr. **STORRY**, Mr. **OSBORNE**, the Reverend
Mr. **TURNER**, and others.

A **Work** founded on Experience; and calculated for general Benefit;
containing chiefly of Improvements made by modern Practitioners in
the same; and containing many valuable and useful Discoveries, never
before published.

ILLUSTRATED WITH

A great Number of **CUTS**, containing Figures of the Instruments of
Husbandry; of useful and poisonous Plants, and various other Subjects,
engraved from Original Drawings.

Published by his Majesty's Royal Licence and Authority.

V O L. I.

THE SECOND EDITION.

L O N D O N :

Printed for **THO. OSBORNE**, in Gray's-Inn;
THO. TAYLOR, near Gray's-Inn Gate Holbourn; and
A. CROWDER and Co. on London-Bridge. **MDCCLVIII.**

[illegible]

1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 26

2. *Chlorophyll a* and *Chlorophyll b* were determined by the method of Arar and Collins (1971).

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

[illegible][illegible][illegible]

1. The first step is to identify the problem. This involves understanding the situation and the goals that need to be achieved.

[illegible]

1. The first group of people who are not in the majority are those who are not in the majority in the majority. This is a group of people who are not in the majority in the majority.

... ..

100-443887-100

THE P R E F A C E,

CONTAINING

The plan of the WORK, as published by the proprietors with the first numbers.

THE occasion of this work arose from certain *materials*, very considerable in *quantity*, and, as we were informed, much more in value; which came into our hands by purchase. They were collected by a gentleman lately deceased, whose *name* we are now authorised to mention; and were intended by him for the *press*. They contain, as he observes, in an introduction prefixed to them, what he had found of value relating to the subject in *authors*, what he had learnt by conversing with the most *intelligent farmers*; and all he had discovered by an *active experience* of more than *thirty years*.

The account we received of these *papers* from some *undoubted judges* into whose hands we first put them, confirmed us in the opinion that they might be *serviceable* to the *publick*, as well as *advantageous* to *ourselves*. The methods we have taken to improve, illustrate, and compleat the plan, the publick have seen; and we hope they have appeared to them as *proper*, as they *seem* to us to have been *successful*.

In consequence of our advertisements, we received many *additions* in the different *branches*; and were offered the assistance of several persons of *knowledge* and *experience* in the subject, to *methodize* and put the finishing hand to every *part*.

Being determined to spare no *expence* or *pains*, toward the rendering so *useful* an undertaking as compleat

pleat as possible, we *purchased* every paper of *value* brought to us; and engaged so many of the *bands* offered to our assistance, that every *separate branch* fell under the care of a *distinct person*, who was a master of that *subject*.

It is now our duty to thank those gentlemen from whom we have received observations relating to the subject in the *counties* where they *live*, and whose *names* with their permission we have inserted in the title.

The *first* thing that appeared upon the perusal of *these papers*, was the *great insufficiency* of all other *books* written on this *subject*: and the want of *such a work* as the materials they contained might supply, was not less evident.

The authors who have written on *husbandry* have all failed, either in *matter*, or in *manner*. They have not been able to *instruct* the *farmer*; or have not been masters of *expression* to convey their *knowledge*. They have either treated *superficially* what they only pretended to *understand*; or have buried their *experience* under such a load of *needless* and *ill chosen words*, that it has been found very difficult to understand them.

As we were assured there was *sufficient knowledge* contained in our materials, we desired the *style* might be *plain* and *clear*; intelligible to the *farmer*, and not below the *gentleman*: so that every *part* might be acceptable to every reader.

After this care that the present work might be *understood* by *all* persons, we made provision that they should also in other respects understand *one another*. Till this time a discourse on the subject of husbandry between the *landlord* and his *tenant*, was generally unintelligible to both: nor did the farmer of *one* county understand the language of him who lived in *another*. The most useful *writings* have also lost their effect from the same *cause*. This was an old and *general* complaint; but no *remedy* had been *hitherto* applied.

P R E F A C E.

v

The misfortune arises *solely* from the employing terms in the *art*, and *names of things*, used and understood only in *particular places*, or only by the *working people*. To prevent this, not only all the terms used in the present *treatise* are clearly explained; but those also which have been employed by *others*: so that husbandry will, we hope, be hereafter as generally understood, as it is universally useful.

Having thus explained the manner in which our plan has been *executed*; it will be proper to lay before the public a short view of what it contains.

We have used, as before observed, *all endeavours* to compleat the original author's *design*: and an undertaking so extensive, we are sensible less than the assistance of *numerous communications*, and the labours of *many persons*, could never have *accomplished*.

Agriculture is here traced from its *small and simple original*; followed through the *several ages*, and examined in the *practice* of the *different nations*, wherein it has been *improved* down to the *present time*. From the *barvest* of the *old Romans*, it is pursued through the *vineyards* of the *modern Italy*: nor are the late improvements in *France*, or the useful labours of the *Swede* or *Russian* omitted. The practice of one country differs from that of others; yet they may learn one from another. Where the same means have been used in different *places*, and a different event has followed; the attempt has been to find the *cause* of the success or failure: that the truth might be rendered apparent even from contrariety.

Some rules the author has indeed collected from *books*; but they appear little either in *quantity* or *use*, when compared with what he has *delivered* from *his own*, and *others experience*. Having considered the *whole compass* of husbandry, he takes it *all* for his subject; comparing what he had *read* with what he had *seen*, and confirming or rejecting *theory* by *practice*.

The gentlemen whose *assistance* we have procured,
A 3
have

have followed the *same* plan; collecting from *authors* whatever of value he had omitted; and having thus inserted in the work a *summary of all that has been written on husbandry*, they have added the much more *important and much larger part*, all that has been discovered by modern *practice*. Where authors and experience *disagree*, they take *experience* for their guide; and where the practice of one county seems to contradict what has been advanced upon the customs of another, the determination is made on the result of a careful *comparison*.

In this work the *least things* are regarded with *attention*, for the greatest events frequently *depend* on them. Nothing is asserted but upon *experience* or *proof*. The *old* practice of husbandry is condemned or established by the *new*. Easy and familiar things are delivered first; and from them, gradual *advances* are made to the more *difficult*. The farmer will be thus led by the hand, through his whole business; and the *landlord* will be *instructed with him*. The latter will be able to know in all *circumstances*, whether the other conduct himself *right*; and the tenant cannot remain *ignorant* unless by his own *fault*.

By these means we hope the advantage of our work will be as *extensive* as the *plan*. The information of the *farmer* is the enriching of the *landlord*: and the great endeavour of our undertaking is instruction; as the sole end proposed from it is use.

As the *compass* of our undertaking is so *large*; and the *heads* it comprehends are so *very numerous*, we are sensible that a great deal of the *plainness* and *propriety* of the work, must depend upon *their proper arrangement*.

In the intent therefore of leading the *practical husbandman* through the several *branches* of his *profession*, he shall be introduced to the *seat* of his *industry*, (whether his own or rented) and the work begun with *that article* which is to come first under his consideration, the *soil*.

This

This shall be treated of under its several natural distinctions, whether it be *clay*, *loam*, *sand*, *gravel*, *chalk*, or *mellow earth*, considering, if *clay*, to which of the *four principal kinds* it belongs; and in what manner it may be *meliorated*: as also whether *pits* may be opened for the *pottery*, or *brick and tile-making*; for the *brewery*; or *burning* for the service of *other lands*.

When we have in the same manner, gone through the other five kinds of soil in respect to their *improvement* for culture, and their *various uses*; we examine for what purposes they are best suited, from their *situation*, as well as *natural qualities*: which will be fittest for *arable*, which for *pasture*: whether in any part *marle* may be found at a *depth*; or *peat* near the surface: in what places *art* may turn to advantage the imperfections of *nature*: how the *fenn* may furnish a *decay*; and *pits* may be converted into *fish ponds*.

From the consideration of the *soil*, we shall rise to that of the *manures*; the numerous kinds of which will be described; their properties explained; and the particular species pointed out, for different services.

From these we shall enter on the nature of the *fences* in our several counties; and treat at large of *ditching*, *draining*, *bedging*, and *planting*; of the profits arising from *coppice wood*; and of the *timber trees* fit for several *soils*, *exposures* and *situations*: of the *oak*, *ash*, *elm*, *beech*, *maple*, *walnut*, *pear tree*, &c. Under the article *oak* will be delivered the several methods of *sowing* the *acorn*, and raising the *tree* to its full *strength* and *value*; rules for judging of the *timber*, and the ways of *seasoning* it for lasting: giving the *preference* under each head, according to *experience*. In the same manner the rest also will be considered.

After *planting* will be delivered the best methods of *stocking* the farm, under the heads of the *field*,
yard

yard and stable. And here will be introduced the management and advantages of the *cow, sheep, horse, bog and poultry.* On each of these heads a *great number of rules* will be laid down, founded on successful *practice*; and respecting their *breed, their value* at their several *ages, their feeding, and entire management.*

When the farm is thus *prepared, planted and stock'd,* we shall advance to what more immediately bears the name of *husbandry.* This will be considered as *general, or particular.* The several kinds, respecting particular articles, and distinguished by the names of *drill husbandry, and horse-boeing husbandry,* will be *explain'd*; and their *advantages and defects* shewn from the result of *frequent trials.*

The practice of the farmers in *different counties* will be then *laid down*; and from the whole the careful husbandman will be fully informed with regard to *plowing, sowing, barrowing, rolling, hoeing, pulling, cutting and carrying.*

From these *general instructions,* he will be led to the consideration of the several *kinds of seeds*: under which head he will be made acquainted with the *nature, properties, and preparations of wheat, barley, rye, oats, beans, pease, tares and lentils.*

From these he will be led to the knowledge and *culture* of the several kinds of *grass*; to be sown either singly, or with his corn. Here he will be instructed in the nature, value and qualities of *common grass, clover, saint Foyne, lucerne, and the like.*

After which will be shewn at large the culture and uses of such *roots* as may be advantageously planted in *fields*; as the *turnep, potatoe and carrot.*

From *these,* the subject will naturally bring him to such articles as, tho' less *universal,* are not less *advantageous.* Among these will be particularly delivered the *culture, management and profits of hops, flax, hemp, woad, weld, coleseed, liquorice and saffron,* with instructions concerning *madder, and some others,*

others, which tho' not cultivated at this time in England, might be introduced with great advantage.

From the immediate *subjects* of his *profession*, he will be brought to the consideration of their *natural* and *artificial products*; and among these particular regard will be had to the *use* and *management* of *milk, cream, butter, cheese, wool* and *leather*.

The accidents to which his *cattle* or his *crops* are liable, will after this be laid *down*; and the *diseases* to which they are *subject*; with the most *approved* methods of *preventing* or *remedying* each.

Under the first head will be shewn the effects of *drought, rains, hail, snows, winds* and *blights*; at what *times* they are to be *expected*; and by what *means* the several objects of husbandry may be most effectually *secured* against, or best *preserved* from them.

The other head of enquiry will lead to the *diseases* and *distemperatures* of his *cattle, corn* and *trees*. Under the first article will be considered the *mar-rain*, the *rot*, the *particular distemper* now raging among the *horned cattle*, and their being poisoned by unwholesome *herbs, insects, or waters*.

The *causes* as well as *symptoms* of these several disorders will be explained from *repeated observations*, and the *concurrence* of *authors* and *experience*: and the best *known* remedies for *each* will be *set down*.

The distemperatures of *vegetables* will be arrang'd under three heads, as they affect *trees, or roots, corn, and other herbage*. And in the enquiry into their *cause* and *origin*, will be considered at *large* the mischiefs occasioned by *insects*, as the *fly, slug, worm, grub, caterpillar* and *locust*; and every method will be *inserted* which *experience* warrants, or *reason* recommends to the trial, for *their destruction*, or the *preservation* of the *crop*.

To these will be subjoin'd the mischiefs to which *corn* and other *valuable growths* are subject from *weeds* and *birds*, and the *easiest* and most *certain* methods

thods will be delivered for the *extirpation* of the one, and for preservation from the other.

From the ample, distinct, and plain manner in which *these* and a number of *other* subordinate articles will be treated in the course of this *useful* work, we persuade ourselves the farmer will be fully instructed how he is to conduct himself in the *field*, the *house*, the *dairy*, the *stable*, and in *hay-making* and *harvest-work*; and *that* in such a manner as to procure all possible *good*; and prevent all *ill* that can be *avoided*, in the care of his *plantations*, his *stock*, and his *crop*: that the *established husbandman* will find many *profitable* things therein with which he was *not before acquainted*, and that the *young farmer* will set out in his profession with the advantage of others *experience*.

The plates will contain figures beautifully engraved from original drawings.

1. Of the instruments of husbandry used in different counties in *England*.

2. Of all the poisonous plants in *England*.

3. Of the most useful and valuable herbs wild or cultivated; and various other subjects.

The A U T H O R S

A N D

P R O P R I E T O R S.

C O N T E N T S.

BOOK I.

Of the soil.

THE INTRODUCTION. *Treating of the soil in general* page 1

CHAP.

1. <i>Of discovering the nature of a soil by the situation and surface</i>	3
2. <i>Of judging of a soil by its common produce</i>	4
3. <i>Of judging of a soil by the growth of trees</i>	6
4. <i>Of the several kinds of soils</i>	7
5. <i>Of clayey soils in general</i>	9
6. <i>Of red clayey soils for tillage</i>	11
7. <i>Of red clayey soils for pasturage</i>	15
8. <i>Of red clayey soils for trees</i>	17
9. <i>Of yellow clayey soils for tillage</i>	19
10. <i>Of yellow clayey soils for pasturage</i>	23
11. <i>Of yellow clayey soils for trees</i>	25
12. <i>Of the white clayey soil</i>	26
13. <i>Of the black clayey soil</i>	28
14. <i>Of loamy soils</i>	31
15. <i>Of sandy soils</i>	35
16. <i>Of gravelly and stony soils</i>	38
17. <i>Of chalky soils</i>	43
18. <i>Of mellow earth</i>	47

Of the uses of clay, loam, sand, and other substances found on or in the earth, in the various arts; and their value to the owner.

The INTRODUCTION page 55

CHAP.

1. <i>Of the uses of clay</i>	56
2. <i>Of the uses of loam</i>	62
3. <i>Of the uses of sand</i>	66
4. <i>Of the uses of gravel</i>	68
5. <i>Of the uses of chalk</i>	70
6. <i>Of fullers earth</i>	72
7. <i>Of ochre</i>	75
8. <i>Of peat</i>	77

BOOK II.

Of manures. In TWO PARTS.

I. *Of natural manures.*

The INTRODUCTION. *Of manures in general*

83
CHAP.

CONTENTS.

CHAP.	page
1. <i>Of the nature of marle</i>	84
2. <i>Of the several kinds of pure, and unmixed marles</i>	86
3. <i>Of the several kinds of impure, or mixed marles</i>	88
4. <i>Of certain marles found in particular counties</i>	90
5. <i>Of seeking marle</i>	92
6. <i>Of suiting marle to the land</i>	95
7. <i>Of the manner of using of marle</i>	99
8. <i>Of the vast fertility of marled lands</i>	102
9. <i>Of the use of mud as a manure</i>	105
10. _____ <i>clay as a manure</i>	107
11. _____ <i>loam as a manure</i>	110
12. _____ <i>sand as a manure</i>	112
13. _____ <i>gravel as a manure</i>	118
14. _____ <i>stone as a manure</i>	119
15. _____ <i>chalk as a manure</i>	121
16. _____ <i>salt as a manure</i>	125
17. _____ <i>sea weeds as a manure</i>	127
18. _____ <i>sea shells, and their spawn, as manure</i>	129
19. <i>Of parts of trees and plants, us'd as manure</i>	131
20. <i>Of parts of animals, used as manure</i>	133
21. <i>Of dung in general as manure</i>	135
22. <i>Of horse dung</i>	138
23. _____ <i>used singly or alone</i>	141
24. _____ <i>made into compost</i>	142
25. <i>Of laying on of dung</i>	144
26. <i>Of the virtue and quantity of horse-dung</i>	145
27. <i>Of cow dung</i>	146
28. <i>Of sheeps dung</i>	147
29. <i>Of hogs dung</i>	150
30. <i>Of pigeons dung</i>	152
31. <i>Of the dung of poultry</i>	153
32. <i>Of human excrement</i>	157
33. <i>Of urine</i>	159
34. <i>Of rags</i>	161
II. <i>Of artificial manures.</i>	
35. <i>Of lime; its materials, and manner of burning it</i>	163
36. <i>Of the manner of using lime as a manure</i>	166
37. <i>Of soot</i>	179
38. <i>Of ashes</i>	182
39. <i>Of burnbaiting</i>	185
40. <i>Of bastard burnbaitings</i>	193

BOOK III.

<i>Of the improvements of land by inclosing and draining; and of the several kinds of fences.</i>	
<i>The INTRODUCTION. Of inclosure in general</i>	200

CHAP.

CONTENTS.

CHAP.	page
1. <i>Of the great advantages of inclosure</i>	201
2. <i>Of the more particular benefits of inclosure, and the objections against it</i>	204
3. <i>Of the several kinds of fences</i>	209
4. <i>Of ditches, and their use in fencing</i>	211
5. <i>Of draining in general</i>	214
6. <i>Of draining boggy lands</i>	215
7. <i>_____ fenny lands</i>	218
8. <i>_____ flat lands near great rivers</i>	222
9. <i>Of the ordering of salt marshes</i>	224
10. <i>Of hedges</i>	230
11. <i>Of raising the quickset, for a white thorn hedge</i>	231
12. <i>Of making the hedge</i>	232
13. <i>Of the seasons for planting, and the choice of white thorn</i>	235
14. <i>Of keeping the hedge in order</i>	237
15. <i>Of plashing a hedge</i>	238
16. <i>Of the profit that may arise from hedges</i>	243
17. <i>Of the sloe, or black thorn hedge</i>	244
18. <i>Of the furze hedge</i>	246
19. <i>Of the holly hedge</i>	248
20. <i>Of the elder hedge</i>	252
21. <i>Of the use of the crab, fallow, alder, and bramble in fencing</i>	254
22. <i>Of the bank fence, with its plantation</i>	256
23. <i>Of the wall fence, with its plantation</i>	260

BOOK IV.

Of coppice wood, and timber trees. In Three Parts.

I. Of coppice, and other small wood.

<i>The INTRODUCTION. Of the improvements made by planting</i>	266
---	-----

CHAP.

1. <i>Of raising a coppice from seed</i>	270
2. <i>Of raising a coppice by planting of sets</i>	274
3. <i>Of the managing and ordering a coppice in its growth</i>	277
4. <i>Of felling of coppices</i>	281
5. <i>Of pollards, or trees for shrouding</i>	284

II. Of the management of timber trees.

6. <i>Of timber trees in general</i>	287
7. <i>Of raising timber trees from seed</i>	291
8. <i>Of propagating timber trees by transplantation</i>	293
9. <i>Of transplanting trees of a large growth, and at improper seasons</i>	295

III. Of

CONTENTS.

III. Of the several kinds of timber trees.

CHAP.	page
10. Of the oak	297
11. Of raising the oak by transplantation	298
12. Of raising the oak from the acorn	300
13. Of the uses of the oak	302
14. Of the growth of the oak	305
15. Of the felling of the oak	307
16. Of the seasoning oak, and judging of the timber	308
17. Of judging of the oak as it stands	310
18. Of the elm, its kind, and proper soil and situation	311
19. Of the propagation of the elm as timber	314
20. Of the uses of the elm in plantations	318
21. Of the value of elm in timber	320
22. Of the ash, its proper soil and situation	323
23. Of the propagation of the ash	325
24. Of raising ash in a nursery	326
25. Of raising ash, where it is to stand	328
26. Of lopping and felling the ash	331
27. Of the uses of the ash, its value in plantations, and as timber	332
28. Of the beech, its soil and situation	334
29. Of the propagation of the beech	336
30. Of the uses and value of the beech	339
31. Of the white poplar, its soil and situation	342
32. Of the propagation, and uses of the white poplar	344
33. Of the black poplar	346
34. Of the aspen tree	347
35. Of the sycamore	349
36. Of the lime tree	351
37. Of the walnut tree	354
38. Of the horse chestnut trees	359
39. Of the chestnut tree	361
40. Of the service tree	363
41. Of the quickbeam	365
42. Of the birch	366
43. Of the horn beam	368
44. Of the maple	369
45. Of the cherry tree	370
46. Of the pear tree	374
47. Of the hazel	376
48. Of the buckthorn	378
49. Of the alder	379
50. Of the willow	382
51. Of the osier	384
52. Of the fallow	386
53. Of the fir tree	388
54. Of the pine tree	392
55. Of the juniper	393
56. Of the yew	395
57. Of the box	396
58. Of the cypress tree	398
59. Of the cedar	399

A
COMPLEAT BODY
OF
HUSBANDRY.

B O O K I.

Of the SOIL.

IN EIGHTEEN CHAPTERS.

CHAP. I. *Of discovering the Nature of a Soil by the Situation and Surface.*

II. *Of judging of a Soil by its common Produce.*

III. *Of judging of a Soil by the Growth of Trees.*

IV. *Of the several Kinds of Soil.*

V. *Of clayey Soils in general.*

VI. *Of red clayey Soils for Tillage.*

VII. *Of red clayey Soils for Pasturage.*

VIII. *Of red clayey Soils for Trees.*

IX. *Of yellow clayey Soils for Tillage.*

X. *Of yellow clayey Soils for Pasturage.*

XI. *Of yellow clayey Soils for Trees.*

XII. *Of the white clayey Soil.*

XIII. *Of the black clayey Soil.*

XIV. *Of loamy Soils.*

XV. *Of sandy Soils.*

XVI. *Of gravelly and stony Soils.*

XVII. *Of chalky Soils.*

XVIII. *Of mellow Earth.*

With an Explanation of their several Natures, and general Directions for their Improvement.

THE INTRODUCTION.

Of the Soil in general.

THE Soil is the ground or earth, in which the farmer's crop is to grow.

A pure soil is a fine mellow mould without any mixture

B

of

of other matter ; but this is found in few places. All other soils are composed of this, with natural additions of less fertile ingredients ; such as sands, stones, clay, and the like ; and as these are in a greater or lesser quantity, the soil is worse or better.

Some of these added matters are in their qualities more pernicious than others : the soil takes its name from them ; and according to their nature it is suited to various purposes : a sandy soil is best for some crops, a loamy for others ; and in the same manner the rest.

The soil thus mix'd by nature is to be the first article in the farmer's consideration ; for on that will depend in a great measure his profits. It is easily examin'd ; for often it shews it self on the surface ; and it is always the first thing that appears on breaking up the ground. It is thence called the underturf earth ; and also vegetable earth, because it furnishes the growth of vegetables, or trees and herbage.

Mould is the lightest of all those substances which compose the earth, and therefore naturally lies above the others. It covers them ; in some places to a greater, and in others to a lesser depth ; and the mixture is usually from the layer which lies under it ; whether that be sand, clay or whatsoever.

This mixture of the soil with the under layer is often made greater by the carelessness of the husbandman, who cuts too deep with his plow, and turns up a part of that with it : but it is almost always mix'd, in some degree, even where the plow or spade never came. Probably the rich mould, when the world was first made, was spread every where in purity over the other beds ; but at NOAH'S flood they were in part mix'd together : and hence the land is less fruitful than it was at first.

When the soil is purest, it is always richest : it is known to be of this nature, by its blackish colour, and mellow softness. Pure mould is tender and pliant ; short, and ready to crumble and moulder to pieces, from which it has its name. It is also called the heart of the land ; and live earth, in some places, because it is the strength of the ground, and the sustenance of herbage.

In proportion as this heart of the land is less mix'd with those barren substances, it will be more fruitful ; and where it is more debased, it will have less fertility. It is plain
also,

also, that in the former case, it will need less dressing, and manure; and in the latter more. The same condition which makes it unfruitful, renders it also expensive.

This condition of the soil is most certainly discover'd by opening and examining the ground; but it may in some measure be distinguished by the surface, and by its produce.

CHAP. I.

Of discovering the nature of a soil by the situation and surface.

THE farmer takes a view of the land before he rents it; and he will thus make some discoveries, from the situation and the surface.

Hills are in general poor and barren; and low grounds rich and fruitful. This rises from a natural cause.

The fine mould being light and loose, is easily wash'd from its other mixtures in the general soil; and being carried off from the hilly parts, by the rains, the remainder becomes so much the poorer. And from the same cause, the valleys are enriched beyond their natural condition, because the fine earth, which is wash'd from the soil of the hills, is carried to them.

This the farmer experiences to his cost; the crop being thinner on the hills than in the valley; tho' from his labour and expence he might otherwise expect it to be greater.

In some places the earth entirely wants this soil, its proper covering; and what should in the course of nature be the lower parts, lie naked. Sand is seen upon the surface of the ground in some counties, and naked rocks upon the hills in others. There is in these cases no mixture of mould with the former, nor any coat of it over the latter; neither does there grow so much as grass to cover them. Such land is scarce of any value; for entire sand can only be fitted for husbandry at a great expence; and bare rocks not at all.

In some parts of England there also rise beds of entire clay, and others of hard and pure chalk, up to the surface of the ground. The clay is in this case almost as barren as the rock: but a short grass will grow upon the chalk.

The rock is quite unconquerable; nothing can make that fruitful: the other three may be brought to produce tolerable crops, according to the methods hereafter to be deliver'd;

ver'd ; but the expence is sometimes too great for the produce, tho' the rent be ever so easy.

In all these cases the nature of the soil may be known by its aspect on the surface.

CHAP. II.

Of judging of a soil by its common produce.

WHEN a farmer has examined a piece of land by its situation and surface ; he is next to observe its natural produce ; and the state of the crops upon it : he may thus form a judgment of its condition, and of the particular nature of each part ; and know the qualities as well as value of the soil.

Where grass, corn, and other valuable growths look strong and healthy, it is a proof that the soil is either rich by nature, or capable of being made so by culture : so that his future pains bestow'd upon it will not lose their reward.

The free growth of weeds (unless fern and rushes) is a proof of goodness in the ground. Care will destroy these ; and the same fertility which supported them, will give sustenance to the crop.

Let him examine not only how liable the soil is to be over-run with weeds, but of what nature and kind they are. As some shew barrenness, there are others which betoken fertility. Some of these wild herbs are common to many soils, yet the greater part are so far peculiar to certain kinds, that the nature and quality of the land may be known by them.

Female Fern, which the common people call brakes, is a sure token of barrenness. Its common place of growing is on heaths. The other ordinary kind of fern is smaller, and is called male fern : This is of a different nature ; it shews the soil is suited to the growth of trees, and flourishes most under their shade.

Clocks of rushes and jointed grass, betoken a poor, damp, and sour land : but, in the fen countries, where a dark green short grass grows among them ; where the rushes stand more dispersed, and where there are seen some yellow short flag leaves among them, it may inform the farmer, there is peat underneath. It is by this the experienced tenant judges about Whittlesea, and in other parts

parts of the isle of Ely; where I have known them offer a large premium for a certain liberty of digging peat upon the land they were about to take, without opening the ground.

These are the weeds which most betoken barrenness; many of those which will be spoken of hereafter, shew the land to have strength and richness.

There is the more certainty in this rule, because the weeds which grow on rich lands, are in a manner peculiar to them. There is no plant found in a clayey, among a stony, or on a chalky soil, that is not also to be found in such as are rich and valuable: But many weeds which are the natural produce of rich, and many which grow in the same manner on light soils, are never seen either upon a chalky, stony, or a clayey land.

The evidence nature gives this way, of the qualities of a soil, is liable to mistake, unless heedfully attended. The farmer must form his judgment, not by those weeds that grow equally on bad and in good soils; but if he sees a plenty of such as grow only on good ones, he may be sure the land is rich.

If fumitory, a low weed with divided leaves and purple flowers; if several of the kinds of orach, and in general such weeds as are found in the mellow beds of a garden, spring up in abundance, he may be sure the soil is rich, fruitful and fine; not one of these will grow free and strong on a starved ground.

Where the corn marigold, which the farmers call golding, or horse gold, grows in abundance, the soil is light and sandy. This is a land that will bear rye better than any other, and that may be brought to value by culture, and suited to every species of corn.

Where the blewbottle is plentiful, and the flowers are of a fine colour, it shews the soil is light and loose, but not without its natural heart: this weed and cockle are proofs of a light but good soil, naturally fit for barley and wheat.

When the flowers of the blewbottle look pale, and the herb itself grows meagre, it is a sign of a stony or chalky earth; or else that there is too much sand: either of these ingredients will occasion that change.

A large quantity of wild garlick, called crow-garlick, among the corn, is a token that the land is clayey. This weed gets sometimes into a stony ground, but that is not its natural soil.

May-weed, called wild camomile, is a mark of a loamy soil; and the same quality is shewn by the wild parsnip, which in Buckinghamshire they call hog weed and swine root. It is indeed the parsnip not cultivated.

The names of these and other herbs, among the country people, vary greatly. In some places that of may weed is given to fumitory; and the like confusion has been common with many others. It is therefore we explain what is meant properly by them.

The weeds which betoken a soil altogether sandy are low; and those of a stony one, are poor and straggling. Where there is a great deal of small scabious, rampant with scabious heads, and the little wild madder, the farmer may be sure there is too much sand; and when he sees the small throatwort he may know it is stony.

A chalky soil is discover'd by its starv'd appearance, by the scarcity and lowness of the weeds, and by the natural growth of base rocket, and the like plants, which are scarce in other places. The yellow Stonecrop or wall pepper, so common on our old walls, grows also on the ground in such soils, particularly on the chalky hills of Kent.

CH A P. III.

Of judging of a soil by the growth of trees.

WHEN the farmer has observed the particular kinds of weeds; and form'd from them, and from the external appearance of the land, a general notion of its nature and value; let him observe the growth of the trees; particularly of those in the hedge rows.

If they be tall, strait, full branched, and well headed, he may be sure the soil is good at heart; on the contrary, where trees grow irregular, low, crooked, or stubbed, 'tis a proof something is bad in the ground.

In this general rule, as in the former, we must admit certain cautions. We are not to expect every particular tree to be of this fair kind; for accidents will injure some; nor are we to imagine every sort of tree must thrive equally, to shew the strength of the soil.

There are good lands on which some kinds of trees will grow fair and fine, while others do not answer so well: this is confirmed by frequent observation; and it may be

be generally explain'd from the depth of the soil, and the nature of the next layer under it.

I was some years ago in Northamptonshire, at a town called Brampton in the Ash, where I soon found the occasion of the name. The ash tree grows thereabout with a freedom and excellence not known any where beside.

These trees are all about that place tall, straight, and of even growth, and on cutting them the grain appears yet more beautiful. It was soft, regular and full, beyond any I have seen.

At Crainford, in the same county, the ash grows no better than usual, but the witch elm is remarkable for its quick shooting, and its beauty. In the same manner, the elm in many parts of Buckinghamshire, and the beech in Sussex, succeed beyond all other trees.

The husbandman from this may take his direction what trees to plant in his grounds, preferably to others; nature giving him the instruction: of this we shall treat at large in its proper place. Trees are mentioned here only as they shew the nature of the soil by their growth, as well as by its other produce; and to inform the farmer not to judge only by the general, but even by particular kinds: for where any one species of the trees in the hedge rows thrives particularly well, he may be sure the soil of the neighbouring grounds has a heart.

C H A P. IV.

Of the several kinds of soils.

WE have described what vegetable mould is when pure; and nam'd the several mixtures from the underlayers of the earth which render it less fruitful; stone, clay, sand, and the like: we come now to consider the soils as differently mixed with these; and thence distinguished by particular names.

There are places, where these several substances, appear entire and unmixed on the surface of the ground; but these are barren: we are here to enquire into the nature of those earths which are produced by a mixture of one or other of them with the vegetable mould. These are what the husbandman calls soils; and he names them according to the substance which makes the mixture; clayey, loamy, sandy, stony, gravelly, or chalky.

These are their general names, by which they are known in all counties, and which are terms understood in all places; because they are founded in reason, and upon nature: but besides these there are many others.

A fine rich mellow soil is call'd in Lincolnshire moory land, because it is the soil of the moors and fens. This is dark and crumbly. A soil of much the same kind in the higher grounds of Leicestershire and Warwickshire is call'd *hen mould*: this is dark colour'd, light and spongy. These two are better for pasturage than for the plow.

What they call *hen mould* in Northamptonshire and Huntingdonshire, differs from this entirely. It is a rich but firm earth of a blackish colour, with streaks of white like mouldiness: the more there is of this, the richer is the soil. We see by this double sense of the same term, how easy it is to confound one thing with another in husbandry: the farmer must be careful to avoid this, or he can have little improvement from what he hears or reads.

Clayey soils are distinguish'd in Hertfordshire and Buckinghamshire according to their colours, into the red, yellow, white and black: but red land in Huntingdonshire means quite another thing, as will be shewn hereafter.

In Northamptonshire there is a clayey earth, known by the name of woodland soil, because it is that on which woods usually grow in that county. This is damp, tough, and deep colour'd; it consists of vegetable earth with a large mixture of black clay; and there is always a layer of sound blackish clay under it.

Sandy soils are distinguish'd also by their colour; as the white, the yellow and the red: but they have also in some places particular names. All soils have some sand in them: this may be seen by walking over them after a shower of rain: for tho' the earthy part naturally covers and conceals the sand, the showers washing it off, the grains then sparkle and glitter.

A soil is not to be called sandy, because there is a small quantity of sand thus mixed among it; 'tis only when the sand is predominant that it has this name.

What is called a creachy soil at Colleyweston, and other places in Northamptonshire, is a sandy earth in which there are bits of stone, and pieces of broken shells, which look as if they were calcin'd: as indeed they are in some measure by the effects of the sun and air, and they tend greatly to improve the land.

The red land as it is called about Halston, Haselbeck and Rowell in the same county, is a sandy soil of a reddish colour, with pieces of red sand stone among it, and sometimes other matters.

That which is called in Leicestershire and Warwickshire a kealy soil, is a stony land compos'd of a good earth, with a great deal of stone or slate among it; like the chippings of a mason's yard. This in many places bears good crops of barley when the large stones are cleared off.

What is called chisely land in most of our midland counties, is a loamy soil, often very fit for wheat, barley, or rye.

As the eye may distinguish the general nature of a land by its produce: the plough discovers the particular nature of the soil according to these distinctions.

The moory soil turns up easy and free: its colour and its mellowness readily distinguish it. The clayey lands are hardest to cut, and hang in tough clods. The hen mould that is streaked shews itself when the sod is first open'd, for it is rarely seen afterwards. The sandy soils turn up easily and regularly; and the stony more unequally. The loamy when they are pure cut easy, and the chalky are always dry and hard. That particular kind of the loamy soil called chisely, has its name from its falling off the plough in pieces like the cuttings of a chissel: for it is one of the shortest of the loamy kinds. It is not so loose as the sandy soils, which fall off from the irons like bran or saw-dust; nor so tough as the clayey, that rise in long flakes; but breaks in small pieces. When a land rises in this manner to the plough, the farmers in many places say it brackles, and they look upon it to be a good property.

C H A P. V.

Of clayey soils in general.

CLAYS, tho' distinguish'd under the terms of red, yellow, black and white, and called by a variety of other names, all agree in their general nature.

They are tough, wet, and cold: and in proportion as they are mix'd in greater or lesser quantity in land they give it those properties in a greater or lesser degree.

Some of the kinds are so much tougher than the others, that an equal mixture of them does more hurt, Thus the
red

red clays & debas'd labils more than any other kind: the yellow are next in stiffness and coldness to these; the black are less wet and tough than either of the former, and the white least of all. The yellow in a larger proportion, will do equal mischief with the red in a smaller, and so of the rest: the difference as at first observ'd, being more in the quantity of the clay in the soil, than according to the particular kind.

The improvement of all soils depends in a great measure upon breaking them; by which means their parts are more expos'd to the sun and air, and are made more fit to receive the different kinds of seeds.

As clayey soils are the most tough of all, they most require this care. The effect of a moderate fire is to reduce this tough earth into a loose crumbly matter: And whatever fire will do on these occasions, the action of the sun and air will also perform, only it requires more time. Oyster shells that have lain a great while on the sea shores are as perfectly calcin'd. by the sun and air, as if they had been in the fire. And in the same manner those shells which are found in marle, and other earths, when they have been a while spread upon the ground, grow soft and crumbly, as if they had been burnt. It is the same with clay: the sun and air will take away its tough quality, as the fire does. Frequent plowing mends clayey soils, by turning up the clods in different positions to the sun and air; and by assisting the operation in breaking them to pieces.

This is the way wherein frequent plowing operates upon a clayey soil, and the farmer who tries it will never be deceived in his expectations.

All clay lands are known by these qualities. They hold the water that falls on them; and when thoroughly wetted, are a great while before they dry: in the same manner when thoroughly dry, they are not soon wetted. In a dry season the land cracks: If it be plow'd when wet it sticks like mortar; and in a dry season the plow tears it up in great hard clods, which are all clay at the bottom. For this reason where the coat of soil is not thick, the farmer must not plow deep, for he will injure his land by mixing the clay among it.

Clayey soils require a great deal of industry and care, as well as knowledge, in the dressing and management: but when the toughness is overcome, so that the farmer can get his grain into them, and see it well cover'd, they very

very often yield large crops. The stiffest clayey soil I have ever seen in England is about Thrapston in Northamptonshire; and yet with thorough management they make it one of the richest lands in the country.

Having thus treated of the clayey soils in general, and shewn the necessity of their careful culture, we shall proceed to examine them particularly, and deliver the methods which have been found most successful in amending the several kinds.

CHAP. V.

Of red clayey soils for tillage.

RED clay, is the toughest and coldest of all the kinds; and requires the most pains to subdue its nature.

It is frequent in its pure and entire state in the counties of Warwick, Leicester, York and Northampton: they have also their share of it in Buckinghamshire: in all these places it is seen in the roads; which are stiff and deep in the winter, and full of great cracks in summer.

It lies also under the soil in all their fields, and is in a greater or lesser degree mix'd with it every where thereabouts. The mix'd soil over these beds of pure clay is generally of a considerable thickness. This is happy for the farmer, as it gives him the liberty of plowing deep, which this kind of land requires more than any other.

The first method for the improving this soil is, by frequent repeating of these deep plowings to break and separate clods over and over, as the sun and air calcine them.

To this is to be added the assistance of dressings. It is the particular quality of this clay, that it will receive all kinds of manures, and be improved by them: but then the labour must be equal to the expence, for without this frequent plowing nothing will take effect upon it.

Dung does not readily mix with this sort of soil; but when it is well plow'd in, it is of great service. This however is not the manure that agrees best with it. In Northamptonshire they manure it with lime rubbish, to some advantage; in Hertfordshire and Buckinghamshire they use shoot and ashes; but that which agrees best of all with its nature is chalk. This is now the general practice; and the farmers in most parts of England begin to find the advantages of it.

The

The husbandman must not be dishearten'd at the expence of this dressing, or the labour of frequent plowings; for he will be sure to reap the benefit of it. It is more chargeable to dress a piece of the red clayey soil, than any other; but the advantage lasts long in proportion: a field of this soil, once well improved, will keep in heart fifteen or sixteen years.

It may be remarked of the clayey soils in general; that altho' no ground is so stubborn or so barren when neglected; none has so many good qualities, when it has been thoroughly wrought.

The more tough and stubborn these soils are, the richer they prove when they are thoroughly subdu'd. Of this I shall give an instance which has fallen within my own knowledge.

There is near Cawcote in Northamptonshire, a piece of ground of small extent, which was the most tough and untractable perhaps in that county, or in the whole kingdom. It was indeed almost an entire dusky clay. For a great many years the farmers neglected it, and it produc'd almost nothing; at length about thirteen years ago a young man dress'd it thoroughly, and he soon found the advantage; which continues to this time. For with a moderate care and industry, it is now the richest piece of ground in the country.

This is an example the young farmer should thoroughly mind: not to be sparing in cost, much less in labour, upon land which never fails to return the greatest, and most lasting advantages.

When this soil is redeft, it is most clayey: when of a duskyer colour, it frequently has more of the right vegetable earth among it: in the latter case it yields the larger crop with less dressing: but when the former is well manag'd it greatly exceeds this. The crops of such a soil may be properly called the rewards of industry.

Clayey soils have advantages and disadvantages with regard to their crops; and those of the red kind most.

The crop upon a red clayey soil is later before it arrives at perfection, than that which is sown with the same circumstances upon a sandy, or indeed on any other land. It is from this the clayey soil has obtain'd among the farmers, the name of the coldest of all.

These soils are coldest where the layer or bed of pure clay that lies under them is thickest. This is known when
pits

pits are open'd for the clay, for the various uses for which it is excellent : these shall be enumerated hereafter. Where it runs very deep, the harvest is always naturally later in proportion.

It is not a wonder a soil should be cold which is almost continually wet : such land is naturally more effected by cold than what is dry : for when a sharp frost comes on in a dry season, it frequently does little harm to the young growths of the garden or the field ; but frost after rain is always destructive.

The damage by frost is not so sudden in a clayey soil as some others ; but when it has taken hold it is more lasting. A slight frost does not penetrate clay so quickly as other earth : but when such a soil is once harden'd, it remains longer so than any other.

When the red clayey soil is well wrought, wheat succeeds excellently upon it. Barley sometimes yields a good crop, but not constantly, for it depends on the season : if that prove dry the barley does well ; but if not it comes to little. This soil holds water a great while, and barley cannot bear a great deal of wet to lie about the roots.

Beans succeed extremely well in this earth, for they will bear a great deal of water : in dry seasons and on a loose land, they yield little in comparison of their produce on these soils. Beans require a great deal of nourishment, and this red clayey soil is the richest feeding land we have, when it is well prepared.

It is not wonderful that proper crops should grow well upon a land which holds so much water : for we see mint, and many other herbs, will grow in water where there is no earth at all.

Notwithstanding these advantages when carefully manur'd ; there are several accidents also to which this soil is liable ; and which are owing to its original nature.

If the season prove dripping for a long time together, and there fall a great deal of rain in May, the crop upon this soil always suffers. Beans bear this best : Wheat becomes stunted and pale, and barley turns yellow : and if the season continue wet they don't well recover.

In a wet and frosty spring, the crops of pease on this soil are also apt to fail. The sure sign is the green shoot turning red : In this case it never recovers. Upon other lands the shoot will get this cast in a bad season, and recover ; but when it happens in a red clayey soil all is lost.

The

The right method is to plow it up at once, and sow the ground with oats.

It was for this reason I did not mention pease among the crops that succeed on this soil. But beside wheat and beans, as also frequently barley, it is excellent for clover; and no land succeeds better with turnips.

The accidents are all owing to the toughness of its nature; and I have from many years experience found, that they happen always most in proportion as it has been least dress'd. It is in itself a very bad soil; but it becomes very rich and profitable by being well manur'd; and those accidents I have named, are all owing to the imperfect culture. I have seen several years that my own crops have all stood well upon a field of this nature, when my neighbours lost theirs, or they produced very little: and the only cause was, that I spar'd neither chalk nor husbandry; while they were frugal of both: and oftentimes my good success and their loss, have happen'd several years after my last chalking of the ground.

The young farmer, who has a piece of land with this soil upon his hands, must not spare either labour or expence in the beginning. Let him plow it thoroughly and often, and see the plow cut deep. Let him employ a careful and honest plowman that will mind his business, not an idle boy, as is too often done. And let him go over the land frequently himself to see that it is well cut up, and broke in every part.

Let him bestow chalk enough upon it, and see it work'd well in; or if chalk cannot be had, let him use some of the other manures just mention'd. When this is thoroughly done at first, common care and industry will serve afterwards: and from this he will have a soil, which, instead of holding the water to chill his crops while young, will let the wet when it is too much, below the roots; and yet will always detain enough.

This done let him depend chiefly upon his wheat: for that grain upon a red clayey soil thus manur'd, will never fail him. He may also be sure of beans, turnips, and clover.

Lastly, when he has got his land into good order by industry and expence, don't let him drain it of its heart again by covetousness or folly: Let him not draw away its strength by cross cropping, or too frequent sowings. Moderation is the rule of all things in this life. There is no way to be poor so quickly, as the desire of growing rich too fast.

CHAP.

C H A P. VII.

Of red clayey soils for pasturage.

THE soil which is cover'd with a turf, and that which has been many years open'd by the plow, differ a great deal when compar'd together, altho' they lie in adjoining fields, and are in their original altogether the same.

I remember about eight years since to have been surpriz'd by this observation in Buckinghamshire, but I have since repeated it with the same success in other places; where the earth has been to appearance very different in a plow'd and a pasture ground, though only a hedge parted them. I mention this that no mistake may happen in judging of the soil, but that the farmer may know it to be the same when he sees it. In Buckinghamshire I took up a piece of a red clayey land from a field not well manur'd, which was close, hard, and high colour'd: after this cutting thro' the turf, in an adjoining pasture, I took up a piece of the soil, which altho' redish and clayey, yet was less compact than the other, and of a darker colour. The cause of this difference is, that in pastures the soil keeps more entire, and has its due natural portion of vegetable earth among it: whereas in plowed lands, this is in a great measure wash'd away, and taken up by the crops; so that the clayey part remains more visible.

When the farmer finds under the turf in his pasture, a soil that is like that of his red clayey lands, only somewhat darker and mellow, he may be assur'd it is the same in its nature; and would appear the same with the other after a little plowing.

This soil when there is a due proportion of vegetable earth among it, is excellent for pasturage. It has an unconquerable heart, and the produce is strong: but where it is too near entire clay, it must be assisted by dressings.

Throughout all Buckinghamshire, where low grounds have this red clayey soil, they produce great quantities of grass, and that excellent in its kind, with little or no manure. The reason is, that the rains bring down the light fine earth from the higher lands; and the overflowings of the rivers leave their rich mud upon them, whence they are render'd fertile in a surprizing manner.

The

The farmer may learn from this that the best of all manure for such a soil in pasture grounds, is mud from the bottom of waters. This is the practice every where in Buckinghamshire: They drag up the mud from the bottoms of their little rivulets, and it enriches their pastures that have this soil in a surprizing manner.

The reason why this red clayey soil receives more good from the washings of the hills, the fall of rains, and overflowings of waters, in pasturage, than any other kind, is, that it retains the rich vegetable earth which is brought upon it; the finest part of which gets through the others. Thus its toughness is an advantage.

Even pure rain water as it falls from the clouds, contains a great deal of this vegetable earth, as may be prov'd by experiments. When this falls upon a loose soil, the water passes through, and this pure earth, which is the best nourishment of vegetables with it: but when it falls upon this tough soil, or is otherwise brought upon it, the water is detain'd a great while, and the earth is kept when that has by degrees got through. So that all which comes is preserv'd for the benefit of the herbage.

This is the reason why pastures that have a red clayey soil are fruitful, in whatsoever situation; but most when they lie low: as experience in all the counties where I have been confirms.

What they call woodland in Northamptonshire, which is a red clayey soil, tho' in some places render'd dusky by accidents, is also very fruitful in pasturage.

'Tis for this reason that in many parts of that county, the farmers have a great while prefer'd the pasture to the corn lands in many places; and that large quantities of what was heretofore tillage ground, is converted into pasture. The red clayey soil is very frequent there: this requires a great deal of labour and expence in tillage, but very little for pasture: there is also hazard in the former way, as observ'd already concerning the crops of barley and of pease: whereas when it is laid down to pasturage, there is none.

But the carrying this practice too far is not to be commended. There should always be a proportion preserv'd between the pasture and tillage land; that the dung of one be enough to supply the other. Of this I shall speak more largely in its place: it is only hinted here, lest hasty youths should seize on the expedient without seeing consequences.

For

For proof, that there are few soils better than the red clayey land for pasturage, I shall observe, that the finest and richest knot of pastures I have ever met with, lies about the point where the counties of Leicesters, Warwick and Northampton meet, particularly in the Lordships of Ashley, Elington and Thurnley; and that in all these the soil is of the red clayey kind; only render'd dusky by the greater mixture of vegetable mould, which there always is in pastures.

We have thus endeavour'd to shew the young farmer the nature of this soil in pastures, and its value: as also to give him the reasons of it: when things are understood, they are always better remember'd.

The advice we have to give him therefore is this. Not to be too hasty in making changes from tillage land to pasture, or from pasture to tillage, because a great deal is in this to be consider'd: let him leave things as they are in this respect, till he has very well weigh'd them. Let him not be hasty to lay down plow'd lands into pasture, to save expence and prevent hazard; nor on the other hand, to turn up good pastures for corn land, for the sake of the first crop. That will probably indeed be good, because of the quantity of fine earth originally in the soil; but when this is exhausted, he sees at what an expence of labour and manure, he must supply its place. The soil is soon drain'd of this its natural richness, and without the assistance of art afterwards it will do little.

CHAP. VIII.

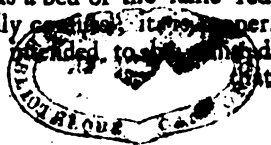
Of red clayey soils for trees.

THE planting of trees, and the manuring of pastures, are subjects to be treated of hereafter in their places: we are here considering the nature of particular kinds of soil, and they are nam'd only to shew how they suit them.

The consideration of land, in respect of trees, must be carry'd deeper than the soil. This term takes in no more than the upper covering of the earth: but trees send their roots farther down, and there seek nourishment.

However, as the red clayey soil generally runs thicker than others, and as it commonly has a bed of the same red clay under it, of which it principally consists, it is more proper in this work, wherein nothing is intended to be amended

C



that is useful, to consider the soil in this respect.

All trees do not thrive equally upon all lands. This depends partly upon the richness, or the poorness of the soil or upper earth itself : and partly upon its bottom. Some trees pierce deep into the ground with their roots, others spread them far and wide, under the surface, at a small depth : of the first kind is the oak, and the ash is of the latter. The ash therefore may thrive in a place where there is some little depth of good earth, and the under layer is rock, but the oak cannot.

This may shew, in what respect the red clayey soil is fit for trees ; and in what it is not.

The ash grows well at Brampton because the soil is light and rich : but in Eltinton hundred, in the same county, where the pasture is also rich, this tree does not thrive at all : the soil is there of this red clayey kind. On the other hand, the oak grows well in the latter place, which in the other fares but indifferently.

The red clayey soil therefore is fit for the oak, but not good for ash. And in general it will succeed with all those trees which have tap roots, that is, long single roots that pierce deep into the ground ; and but indifferently with those which have shallow and spreading roots, that stretch under the surface. What particular trees belong to each of these classes will be shewn hereafter.

The shallow rooted trees succeed where there is a rich upper coat ; but the deep rooted ones find most advantage where the under layer is such as they can penetrate, and is capable of affording some nourishment.

Whatever kind of tree once takes in this soil will continue to thrive ; whereas in others, there is often a promising appearance at first, and they die off afterwards. If the growth be slower in this coarse soil than it is in some finer, the timber is always firmer, sounder, and better in its kind.

The trees which succeed upon this soil always grow strait and lofty, because of the depth of the ground ; whereas those which shoot apace, from their standing in a rich soil with a bad bottom, grow stubby afterwards, spreading out their tops instead of rising to a height.

Those trees which suit this land may be planted safely in places where others cannot, for they never hurt any thing that is sown in the adjoining ground. Trees which spread their roots starve the growths that are near them ; but these draw

draw their nourishment from greater depths, and consequently hurt nothing ; farther than their shadow.

Our advice to the farmer, on this head, is, that when he is about to plant he view the ground, and see what trees thrive best round it ; and select those sorts for his purpose.

CHAP. IX.

Of yellow clayey soils for tillage.

YELLOW clay is nearly ally'd to the red ; and is next to that the most frequent. It is as universal in some counties, as the red is in others ; and is so much of the same structure, that a great many of the rules laid down in the preceding chapters will hold true here. But as chalk is the best manure for that ; marle, where a proper kind can be had, is best for this.

Let the farmer rightly understand what is meant by a yellow clayey soil : and observe the difference between that, and the yellow loam, to be described hereafter in its place : otherwise he may hurt himself from the most strict observance of rules, by employing his manures upon a wrong ground.

Yellow loam is a mix'd earth, compos'd of clay and a great deal of sand, with little other matter. The yellow clayey soil is a mixture of yellow clay with a greater or lesser portion of vegetable earth. It resembles the red clayey soil, except in colour, and has no other sand in it than the general small quantity which is found in almost all earth.

The yellow loam is crumbly ; the yellow clayey soil is tough. One breaks off in little parcels from the plow ; the other rises in long heavy flakes.

Having thus distinguish'd what the yellow clayey soil is, we shall consider it with respect to tillage, in the present chapter ; and as it is concern'd in pasturage and the growth of trees, in the two succeeding. The farmer should perfectly understand his soil, before he enters on any other part of his profession ; for it is the foundation of all.

Yellow clay is oftener found pure and entire than red : and when it is so, its toughness in wet weather, and its stiness in dry, render it very difficultly manag'd.

In this clayey soil there is always mix'd more or less of yellow earth ; and according to this it is more or less fruit-

ful in the first tillage ; and requires greater or lesser expence in dressing afterwards.

The stiffer this soil is, the more barren it is ; and the more brittle the more fruitful. It is most stiff where there is the least mixture of earth with the clay ; and, in consequence, it is more fruitful, where the mixture of earth is larger.

This is seen in nature, and this art is to imitate. Where the mixture of earth was not originally enough in quantity ; or where it has been wash'd away by rains, or drawn off by frequent crops ; the want is to be supply'd by some manure which will break its stiffness ; or by the plow, the air and sun, which calcine it till it is crumbly. Both these join'd together render it lastingly fertile.

What in many places they call hazel mould, is a mixture of yellow clay, with a blackish mellow earth. This makes the best soil, that is naturally form'd of that clay ; and is excellent for wheat and rye : it will bear other crops well, but these two best.

The common yellow clayey soil is in its nature much poorer than the hazel mould just mention'd : and its improvement is to be begun by frequent and deep plowings. When the clods are broke, and the matter render'd more crumbly, manures are to be apply'd. This soil takes them better than the red : and I have discover'd by repeated trials, that nothing is equal to marle : ashes, soot, and even sand, are useful also ; and dung, after the first dressings, will mix well with it.

In Oxfordshire they make a manure of chalk and ashes to great advantage.

In Staffordshire, where this soil is frequent in the common fields, after sowing it the two years, they fallow it the third in ridges toward the latter end of March. They plow it a second time about three months after, or a little sooner ; and before this, they dress it with cow-dung, or horse-dung, except when they fold it with sheep : then it is immediately spread and cast under furrow with the plow, before the sun and rain exhaust the dressing. Ten weeks after this they plow it again to kill the weeds ; and to turn up the manure. About the week before Michaelmas they plow for sowing, and then the manure is again turn'd, and falls upon the seed together with the finest part of the land.

They

They sow wheat upon the land after this dressing, and afterwards beans, with both which the yellow clayey soil agrees after this preparation.

When they have the same soil in their enclosed grounds, they manure it with a light marle. They have a greyish kind in that county, which crumbles after the least rain, and this they use for these purposes: with this dressing it will yield good grafs after eight or nine crops.

This practice is not altogether the best that can be used, but we see the effect it takes; and therefore much may be gather'd from it.

They plow it four times for wheat. This, with the effect of the air breaks the soil, and makes it loose and crumbly. The rains then soak into it, instead of lying upon it, or running off without benefit, and leave behind them the fine earth they contain.

The same purpose is forwarded also by their laying it in ridges, because more of it is in that situation exposed to the air and rain. After this, once plowing does for beans, because the earth is already improved by this repeated tillage, and because beans do not require so fine an earth to cover them as corn.

The farmer seeing things in this light, will understand the reasons of his success in every article; and will be enabled to improve his lands, and enrich himself, upon the principles of reason.

He will see the disadvantage of the common field management, and the great benefit of the dressing given in the enclosures in the strongest light. In the first every third year is lost. Nor is that all: they lose also a great deal of the advantage of the second year: For in the other way, a good husbandman after his crop of beans, pease, oats, or barley, has good turneps or clover.

Instead of this loss, the enclosed land of the same kind manur'd with the grey marle, yields eight or ten years crops successively; and at the end of this plowing when it is laid, to gain fresh heart, it yields good grafs. No time at all is lost: Nor is it really necessary to let it lie still at all; for if they keep marling it constantly, they may plow constantly: the dressing supplying nourishment for a new crop, as soon as the old one has exhausted the former.

Upon the whole, our advice to the young farmer is, that he consider what kind of manure he can best command, and

at least expence : for this is a consideration that will weigh against any other.

Let him begin by plowing deep and often ; and let him lay up the land in ridges, observing to place them east and west, that the sun may have fuller effect.

If there be marle in the neighbourhood, let him examine whether it be fit for the improving of clay. If it be firm and heavy, it is not proper. The lighter is always the better for this purpose. Let him throw a piece of it into a bowl of water. If it begin presently to crumble to pieces of itself, and in a short time fall to a kind of powder, it is fit for the purpose ; but if it continue in a lump, and the water have little effect on it, 'tis not for his use for this kind of soil. We shall speak largely of manures hereafter : this may suffice for the present occasion.

If he have a proper marle at hand, let him lay it on in plenty for the first dressing ; and repeat it in moderate quantities afterwards : If marle of the right sort be not in the way, let him use chalk and ashes. This does not take so quick an effect, because it does not get into the body of the clay so soon ; but the expence and labour are very well repaid, because the benefit is very lasting.

If the first manure be marle, he may continue the same without any addition : but if chalk, he will do well to give the assistance of other lighter kinds occasionally. Saw-dust, when it can be had in quantities, is a great promoter of fertility in this kind of land. It acts in the same manner as the decay'd stalks of plants, than which nothing is richer.

In some places where other manure cannot be had, sea sand may be used for the improvement of the yellow clayey soil. This must be laid on in very large quantities : this may seem strange advice to the farmer in some counties, where such a thing was never heard of, for every thing appears strange at first ; but it is a practice founded on reason. The cause of barrenness in clayey soils, is the toughness of their substance : Sand breaks that toughness, and gives way for the rains to penetrate them. Loams are fruitful, and these are only mixtures of clay and sand. Nature has made the mixture in these places, and why may not art and industry imitate her.

By large dressings of sand, a clayey soil may be turn'd into a loamy one for ever ; and after this an addition of such manures as we shall order for loams will be most useful. Nor is it a wonder that sand should in this manner meliorate clayey ground ;

ground; for clay is used in the same way as a manure to sands of which more hereafter.

Althes which are a very good manure for yellow clayey lands, act in a double way, both as the sand, and by their other qualities; warming, as well as opening the land: and after the more substantial dressings, foot is an excellent manure. Nor is burning to be forgot for the improvement either of this, or of the red clayey soil; for it breaks their parts in a surprizing manner, rendering them not only fruitful in themselves, but converting them into a manure for other lands.

CHAP. X.

Of yellow clayey soils for pasturage.

THE red clayey soils are rich in grass when they lie low, because they retain the advantage brought to them by waters: But experience shews this is not so much the case in the yellow; for when they are in a low situation, they are too damp for any good produce.

Their substance is more compact than the red, and they do not let in that fine earth which comes with rain or inundations; and which mellowes and enriches the red clayey soils in the like situation.

The yellow clayey soil contains less of the vegetable earth in general in its mixture than the red: that is, it comes nearer to entire clay. A piece of this soil taken from under the turf in a pasture, is seldom richer than a piece taken from a plow'd ground of the same kind. From these observations we may fairly judge the yellow clayey soil is, for the generality, much poorer than the red. And this is the reason marle is so excellent a manure for the yellow; because it dissolves into so fine a substance, that it mixes with the clay, and serves in the place of that earth, which nature has denied in the composition; breaking also the tough texture of the soil, and letting in rains.

But tho' low grounds that have a yellow clayey soil, do not usually produce so good grass as those of a red: this kind is upon an equality with the other when it lies dry. It is a very common soil in the high pastures in Bedfordshire, and grass there is excellent.

As a soil may be judged of in general by its natural growth, so it may also with great justice in particular places. It is

always a mark of good pasture ground, that a great quantity of cowslips naturally grow there; and there is no soil that produces so many of these, or so strong as this: nor is it apt to be over-run with weeds, except thistles. These are known to be the natural produce of all soils that are clayey, and have a good heart.

The farmers in Bedfordshire observe, that the yellow clayey soil affords a good pasture to feed cows. Abundance of cowslips is another mark of this, and I have observ'd in many other counties, that there is no pasturage so well agrees with that animal.

The disadvantage of these pastures, especially when they are on the slope of a hilly ground, is, they are apt to be moist in winter. In Warwickshire they prevent this by digging deep trenches thro' them. These receive the wet and carry it off by degrees, as may be known by the continual dribbling at their openings.

It is good in pastures to have a firm bottom that will detain some moisture; and this is one reason why those on a yellow clayey soil are excellent: for they have usually a pure yellow clay for the under layer, and that is one of the firmest of earths.

A pasture that has a yellow clayey soil, and that lies high, will need frequent feeding or manuring, whereas those of the red kind in a lower situation, are dress'd by nature, as observed before: but then the hay of the best low lands, is not to be compared with that of these higher grounds.

The finest hay I have ever seen, has come from high grounds, where there has been a yellow clayey soil.

Our advice to the farmer is, that he always examine the earth, and that he never fear to take an upland pasture, if this be the soil; though it appear but in bad heart: he may be sure there is what is right at bottom, and he may improve it at pleasure.

Let him not spare manure or labour. The money that is saved that way is lost ten-fold.

The best manure for upland pastures of this soil, is dung mixed with mud from the bottoms of rivers, or the cleanings of ditches. He should lay on this at such a time, that the rain will wash in its richness before the sun evaporates it. He cannot spread it too fine in such a season.

The best manure of all for this ground, when it can be had, is the bottom of old haystacks. There is always there a fine rich mould; and the quantity of hay-seed among it is
no

no small advantage : it sows the ground afresh, and comes up with all the strength of the manure.

In Staffordshire, where the low pastures are often of this soil, they manure them with marle, and it excellently answers their purpose. Where the mud brought by the overflowing of a river, would only lie upon the surface to be baked by the sun ; the marle will make its way into the very heart of the soil.

CH A P. XI.

Of yellow clayey soils for trees.

TREES do not shoot quick in this soil ; but there is a soundness and heart in it that gives them a great deal of strength.

The nature of this soil approaches very nearly to entire clay : and it is known by all experience, that no tree whatsoever thrives well in that. This is not a soil therefore on which plantations are to be made for the advantage of the wood.

There is another reason against planting on the yellow clayey soil, for the growth of the trees will be very slow. It is a remark of Mr. Evelyn's, that trees growing on this kind of ground, require thrice the time to come to their due stature : and this experience confirms. We see trees keep many yeers almost of the same bigness on this soil : and as for such as are large, it is hard to know when they were planted.

Fruit trees grow as ill in this soil as timber trees : and it often alters the quality of the fruit. Apples of the same kind have a different flavour, when the trees stand in a good light soil, from what they have in this yellow clay.

Another disadvantage of the yellow clay for these is, that the trees which grow in it are more liable to moss, than those on better soils : every one who has at all consider'd the products of the orchards, knows how great a disadvantage this foulness is to fruit trees of all kinds.

The farmer who has land with this soil on his hands, knows from this what to expect from it. It will answer exceeding well with proper care, in plowed fields and pasture ; but he is to remember not to make orchards or plantations upon it.

If he see large timber upon the ground, particularly if it
be

be oak, he need not fear bargaining upon that head, if it come within his design; for 'tis more likely to be found than on any other. Oaks on this soil are very tedious, but they are very firm.

This soil is also fit for the raising seedling trees, which are to be transplanted to another. For, as they never thrive well when removed from a better soil to a poorer: so on the contrary they succeed to admiration, when they are taken from a soil of this kind into good mould.

We see from repeated experience, that altho' the red and the yellow clay agree in many respects: there are several others in which they are entirely different. This is the use of collecting observations from different places and persons.

Although these are alike in many respects, the two which follow, namely, the black and the white clay differ from them almost in all: so that he who talks of a clayey soil, unless he expresses the colour, says nothing. In general, when that expression is used, it means a red or a yellow.

C H A P. XII.

Of the white clayey soil.

EVELYN observes, that some clays are so obstinate, nothing will subdue, and others so voracious, nothing will satiate them. Of the first kind are the two former, the red and yellow; of the other, the two succeeding, the white and black; but principally the white: the black in some places approaching to the nature of the others.

We have shewn in what manner the most stubborn of the former kinds, may be subdued either for tillage or pasture: and shall here from the same foundation of experience, instruct the farmer how he may satiate and fill these, whose hungry nature has seemed to many not to be conquer'd.

It has been said clay contains about a fourth part of fine sand. Houghton has affirmed this, and brought the proof of it from his own experiments. But 'tis only of the red and yellow clays this should be affirmed. The white clay contains none: nor would be difficult to produce yellow clay altogether pure from it. Indeed there always is some in the red, and this is a reason why the red clayey soil is not quite so stubborn as the yellow.

It

It may appear strange, that among soils of the same name, contrary methods are to be used in the culture; but this is the case between the red and yellow clayey soils, and the white: these really agree in nothing but the name, their qualities being altogether different.

The farmer is to observe contrary conduct with the white clayey soil, from that proper for those before-mention'd; for his aim is to be just opposite: his care with the others was to make them fine enough: but when he has a white clayey soil to manage, he must take care he does not make it too fine.

As the red and yellow are tough and stiff; the white is tender and brittle: it breaks as it falls from the plow: and from its nature in this respect, it yields to that implement with great ease.

Frequent plowings were order'd for the others, but a few do for this. As no soil requires so much care in the manures, the farmer's attention is to be employed almost entirely on that head. In general, as the yellow and red clayey soils require strong, this white one requires rich dressings.

The finest manure for it is soot. This they practise in Hertfordshire with great success: and had Mr. Evelyn seen the effect of that manure, he would have alter'd the expression.

Soot may seem at first sight a dear dressing; but a little of it goes a great way. Experience shews that one bushel of it is equal in its effects to a load of dung.

Eighteen bushels of good soot will compleatly dress an acre of the white clayey land; and the same quantity of ground will take as many cart loads or more of good dung. But let the farmer take care he is not imposed upon in this London commodity: the chimney sweepers are apt to mix ashes among their soot to encrease the quantity; and then it may require five and twenty bushels to an acre.

The only way is to deal with reputable persons: and, to speak from experience, I have found Mr. Fat of Castle-street, who is the King's sweeper, one that never imposed upon the farmer; nor let his servants impose upon him.

The next manure for this soil is dung. And the farmer will find the practice of folding upon it is excellent. Ellis recommends the folding first; and afterwards spreading it all over with the dung: and this has been found of great service.

Turf

Turf and dung also suit excellently with this soil : but they should lie to be mellow'd together a great while.

The white clayey soil when dress'd in this manner, never fails to yield large crops. I have seldom known the price of manure not answer on any land ; but there is none that brings home the money so sure, as that bestow'd on a soil of this kind : for it is an indifferent land in its own nature, but with this culture it scarce yields to any.

It is not a common, nor a profitable pasture soil, nor for the growth of trees.

C H A P. XIII.

Of the black clayey soil.

TH E black clayey soil is the richest of them all.

The other kinds may be brought to fertility by art, but this enjoys from nature the same advantages. The mixture in this soil is so happy, that it is in its own native state, much like what they are when improved by culture : yet even this is capable of great improvement ; and will yield twice the produce in the hands of the skilful and industrious, that it does to the inconsiderate or ignorant.

This soil consists like the others of a blackish clay, which is mix'd with a quantity of vegetable mould ; and it also contains sand, sometimes in a very large, usually in a more moderate quantity.

The clay in this is not so tough as that of the red or yellow, as appears when they are examin'd singly ; nor yet is it so short and crumbly as the white. Thus its own nature tends to its making a better soil than either : the sand which it contains answers the purpose of that which in other cases is to be added ; and the quantity of vegetable mould gives it great fertility.

Such is the composition of this excellent soil. In respect to its structure and consistence, it is of a middle nature between the white clayey soil, and the yellow or red ; and it exceeds them both in fruitfulness.

This soil does not require those painful or repeated plowings, nor that expence and tediousness of manure which are necessary to the others : but light turnings and rich manures in small quantities, answer the purpose. These must be used according to knowledge, and as there is no land so well

worth the studying as this, there is none that will so well reward the pains.

The varieties of this land are called in different parts of England by various names. In Hertfordshire, where they are more careful about the culture of their land than the naming it, they are all called black clay; and the same methods are taken with them.

In Huntingdonshire they have three kinds of them, to which they give different names; they call one white land, another black land, and the third wood land.

One would think by the name of the first that it belong'd to another place: but, in reality, it has little title to that name: it is very nearly allied to their black land. When wet, this looks as dark as that does; and when dry, the black itself becomes greyish. The greatest difference in colour is when both are thoroughly wet, and new turn'd up with the plow. What they call white land appears then greyish; and the other very dark: but they differ more essentially in their natures.

The black land is more clayey than the other, and consequently requires more manure: this is much inferior to the black clayey soil in other counties. It sticks to the plow when work'd in a wet season, and has all the marks of a common clayey soil. They manure this with marle; and where that is not to be had with chalk.

This may be an instruction to the farmer, to distinguish one clayey soil of a blackish hue from another; and to treat the worse kind properly when he meets with it.

The white land of this and the neighbouring counties, tho' so call'd, is truly of the black clayey kind, it is dark enough when wet, and falls off the plow-share easily, breaking into small clods. It is a rich land; and is to be treated as the best sort of this soil.

The wood land of this county is nearer the black clayey soil of Hertfordshire than any other. We have named a soil called wood land in some parts of Northamptonshire, which is rather of the nature of the red clayey soils: but they have also in that county a wood land, in particular about Pynchely, which is truly of the nature of the Huntingdonshire wood land; and as rich. They have also the black and white lands, and they call them by the same names.

Having explain'd the different names under which the black clayey soil is express'd, we shall treat of its general nature, which is soft, mellow and crumbly; breaking in the least frost.

This

This soil is richer in Hertfordshire than in any other part of England: it is there pure and unmixed. In Northamptonshire, it is somewhat stony; but the stones are small, and they are of use rather than detriment, for they break and open it, giving room for the rains, and for the shooting of the seed.

Too much wet is bad for this land; therefore those fields of it which lie somewhat high, are the most profitable: but the generality of it is found in lower places.

This soil neither requires so much plowing as the red and yellow kinds; nor will it do with so little as the white. Moderate plowing is best: when it lies low the farmer should plow it with a foot plow, only one way, in broad lands, laying it high in half acre pieces. This is the way to avoid its being too wet; as it is very apt to be in low grounds.

The farmer who should dress this soil like the other clayey kinds, with chalk, sand, and ashes, would be guilty of a strange error. Mellow dung is the proper manure; and adds to its natural richness. Cow dung is not amiss, but the best of all is the dung of pigeons. The way of using it is this. It is to be sprinkled over a barley field for instance by hand, as soon as the barley is sown. The rains wash it in, and the effect is surprising. Nothing can exceed the crop that follows this dressing on such land.

The dung of poultry is also good used in the same way; and any other rich and mellow manure.

The black clayey soil in pasture land is very fruitful, and needs less dressing than any other: the best manure is dung, that has lain till well rotted: this is to be carefully spread over the ground, and should be laid on in a rainy season.

Trees of many kinds prosper well in this soil; and nowhere better than in Northamptonshire, where not only the soil itself; but the thick bed of clay that lies under it, is intermixed with small stones.

When the clay at bottom is more pure, it is too close, and holds the wet, which chills the roots of some trees to their destruction: but when there are these stones, they make it in some measure loose, so that it lets the water drain out; and at the same time gives passage to the small roots.

CHAP. XIV.

Of loamy soils.

TREATING of clayey soils, we have led the practical farmer thro' a great variety of kinds. There remain yet five other soils to be treated of. But these will be comprehended in a smaller compass, some of them having that variety.

Those of the loamy class naturally follow the clays: they partake of the same substances, altho' from the proportions of the mixture, they differ in their nature.

A clayey soil is no other than clay mixed with some quantity of vegetable mould.

Loam is a mixture of clay and sand: the sand being in a large proportion.

A loamy soil is a mixture of clay, sand, and vegetable earth: or it is a loam, with some vegetable earth among it.

In what are called clayey soils, there is usually a little sand, but this need not make confusion. The character of loam is, that there is a great deal of sand mixed with the clay; and there is also in these soils usually a large quantity of vegetable earth.

The loamy soils are more common than any other: they differ in colour according to the clays, and earths of which they are compos'd; and they differ also in richness and fertility, according to the quantity of vegetable mould in the composition. Even pure loam is not unfit for use, for the sand opens and breaks the clay, so as to render it fit for vegetation; as we see where sand is us'd upon clayey grounds, by way of manure; but when a considerable quantity of vegetable earth is added to this mixture, it becomes very fit for the product of herbage; the clay serving to give it a body.

Loamy soils are the most natural, these mixtures of earths are what may be expected every where: and they agree with almost all kinds of growths, because they are of a middle nature, and in some degree partake of all soils.

They have for this reason been called by some natural soil, and by others mother earth. All plants receive their nourishment from the earth; and as that earth is suited to them, they thrive more or less: now, tho' a loamy soil will naturally support almost any produce of the ground, yet all will not thrive alike in it. The art of the husbandman must
be

be employ'd to suit it to that particular crop he desires should grow upon it ; and this may be done effectually.

Clay and clayey grounds keep in the seed a long time, and push it slowly ; sandy soils make it shoot at once, and forward it hastily. The same seed sown in clay and sand, will be a month earlier in the shoot in the latter than the former. This backwardness of the soil, and this over-hastening quality, are both attended with bad consequences : and it follows, that loamy soils must be very valuable as they partake of each, and are in their composition and effects, of a middle nature between both.

Loamy soils are suited to universal use, for all kind of wild plants grow in them. Some plants grow naturally in clay, and others in sandy soils. The plants which are natives of the clay, will not live in the sand ; nor will those of the sand live in clay : but both will live in loam.

From this and other observations, we see the loamy soil is universal. This must greatly encourage the farmer who has it in his fields, but he is not to think it will do without industry. There is difference between growing and thriving. Things must not only live but thrive with the farmer, and to this purpose he must assist and improve his land when this is the soil. 'Tis well that nature has laid a foundation ; but the rest must come from his industry.

Loamy soils have many appearances. Some call the under-turf earth, loam, let it be of what nature it will, and then the variety is endless ; but without that mistake, the kinds are very numerous.

In Hertfordshire they distinguish these soils into five kinds. These are clayey loams, sandy loams, gravelly loams, stony loams, and chalky loams.

The clayey loam is a loamy soil in which there is an over-proportion of clay, for these soils are all of a mixed kind. The sandy loam is a loamy soil, in which the sand is in too great a quantity : the gravelly loam is a loamy soil, with small pebbles and flints among it ; and so of the other two, the one having stones, the other chalk among it.

The farmer is to consider each as a loamy soil in the general dressing ; but he is to alter that a little for each, by adding what is useful for improving that particular soil, which is over-proportion'd in the loam. If it be a clayey loam, he is to add to the usual dressings for loamy soils, a quantity of sand. This will make up the natural deficiency. And in the like manner he is to manage the others,

In

In Northamptonshire, about Oundle, they have a sort of earth which they call lamb earth. This is a loamy soil, the name is only a foolish way of speaking loam earth. It is a loam with a great quantity of stony matter. This would have been called a stony loam in Hertfordshire: but it differs in many respects, from all the earths in that county.

It is hard and whitish, and beside the bits of stone, 'tis full of broken shells. In some places it is the under-turf soil, and in others it lies beneath that. When it is uppermost, they dress it with dung, and the mud of ditches: where it lies under the soil, they plow deep to turn it up, and there breaking by degrees with the sun and rain, it serves as manure to the rest.

In Kent they dress their clayey loams with chalk; and this is an excellent method. I have examin'd lands that have been for some years dress'd in this manner; and have found that the chalk in time mellows down into the clayey matter, so as to make in the whole a kind of marle.

I have seen lands there not only made very fruitful in themselves by this practice, but the soil of them might have been us'd as manure for others.

Among clays some are so tough, they will not receive manure, others so hungry, they hardly ever are satiated; and sand which takes it readily, lets it go again so soon, that the farmer has not the advantage of his labour: loamy soils have none of these inconveniencies. They are in themselves fruitful: they are loose enough in their texture to let in manure; and they have firmness to keep it.

A loamy soil, where it is not too dry or too wet, is an estate to the intelligent and industrious farmer.

In the dressings, he is more to regard the texture of the soil, than its colour. This last may be various, while the substance is nearly the same.

If it be a clayey loam, let it be well plow'd; then dress it with a mixture of burnt turf, lime, and hog's dung. This receipt I obtain'd from a farmer in Oxfordshire, who kept it as a secret, and was envy'd by all his neighbours. In Buckinghamshire they dress the same soil with cow dung, sharp sand, and ashes of fuzes. I have seen this succeed well, but not equal to the former method.

When the loamy soil is so sandy, clay may be us'd as a manure; and at other times river mud mix'd with dung and rotted turf.

VOL. I.

D

When

When the loamy soil is naturally well mix'd, and no ingredient over-bears the rest, dung in the common way serves to refresh it after it has been exhausted by crops : and as the effect of this is but short, the experienced farmers plow in horn-shavings bought in London, together with hoofs and skins of animals. These not only give great strength and heart to the land, but their effect is very lasting.

When there is too much earth in the loamy soil, the best manure is foot. This laid on in a moderate quantity, gives that soil the only quality it wants, which is warmth. This sort of land receives the manure kindly, and requires moderate plowing.

When the loamy soil has stones in abundance, whether it be a gravelly or a stony loam, the vegetable earth being deficient, good mellow dunging is the best way. Let the farmer bring out all the dung from his yard, horse dung, hog, cow, and poultry dung, and mixing it with mud from the bottoms of rivers or cleansings of ditches, make it into a heap in the field. When he has made up a good hill of this, let him cover it with fresh cut turf, and leave it to mellow.

Let him take a fit season to spread this ; it must not be in summer for the sun or air to waste its strength, but toward autumn, when the succeeding rains will wash it into the ground. Thus will he make a soil very rich ; for these stony loams, tho' barren in their own nature, receive the dressings kindly.

In Surrey, they have a stiff clayey loam, which they treat as follows. After a fallow they sow two crops ; and lay down their land with clover three years. At the end of this time they dung it richly, and then it is fertile for several years again.

In Hertfordshire they plow in clover alone, or with dung ; and some sow and plow in buck wheat ; both these methods have their advantage.

We have treated the more largely of the loamy soil, because it is frequent, and various in its kinds. Nothing concerns the farmer so highly, as to understand its several natures, and the proper management for each. Loam is thus made to suit all sorts of crops ; and is in its own nature, very friendly to grass and trees of all kinds.

C H A P. XV.

Of sandy soils.

IN some parts of this kingdom the covering of the earth is for large tracts together a bare sand. These are barren, for not only the winds disturb the surface continually, and prevent the rooting of plants, except a few stubborn weeds that will grow in dry sand, as others will on almost naked rocks. Sand alone can afford little nourishment to plants; and at the same time it burns their roots.

Sand where it is the uppermost covering of the earth, must be called the soil in those places; but it is not what the farmer is to understand in general by a sandy soil. We mean by that name a soil in which sand is predominant, altho' there be several other earths in the mixture. From the great quantity of sand, these soils are all loose and crumbly.

This is the great article of their distinction: that soil we have described, under the name of a sandy loam, is not called a sandy but a loamy soil, because the clay that is in it, notwithstanding the great quantity of sand, holds it firmly together.

Sandy soils are distinguish'd into several sorts according to their colours. The three principal are the red, the yellow, and the white. There is also a brown, but this is less regarded, and is very barren. It is most common on heaths, and consists almost entirely of sand. This is white, but it gets the brown cast from a barren brownish mould, which lies among the heath and furze roots.

The other kinds have their colours principally from the sand in their composition, red, yellow, and white: but sometimes the earths prevail in this respect.

Beside the sandy soils called by that name, there are others known by various denominations in different counties. The red land, and creachy land in Northamptonshire, are both sandy soils, and so is the chisely land, of the same county, tho' some call it a loam.

What in Buckinghamshire they call the black sandy soil, and in Hertfordshire the black sand, are also of this kind. This might have been comprehended under the general head of sandy soils, to which the other ingredients give the colour; but it is not a black sand that is the principal ingredient, but the mould amongst it gives the black colour to the whole,

whole, though the sand be whitish. We have named this kind separately, because it is much spoken of in some places.

Sandy soils are of their own nature barren; but they are capable of great improvement. Any crop will be sooner burnt up on this than in any other soil naturally; but with proper dressing it supports them very well: this the industrious farmer finds to his joyful experience.

As these soils are dryer, so they are warmer than any other: and they keep their good qualities after the dressing, though they part with their bad ones. The natural good quality of sandy soils, is to push any crop very forward; and their natural bad quality is, that they soon after suffer it to be burnt up: now after due dressings, they will preserve their crop as well as other lands; and they keep their natural forcing quality so well, that the farmer may have two or three crops from them in a year.

Sandy soils of all others are the least productive of weeds: what they have are in general of the smaller kinds; and easily destroyed. All soils that are fit for culture, have their advantages peculiar to themselves; and there is none, but with due management, will prove valuable.

This land works easily under the instruments of husbandry, and freely receives dressings. The redish sandy soils require most manure, the black least; the other two are about on an equality.

No soils receive moisture so readily as sandy ones, but they freely let it out again. The rains that fall on clayey soils, often do not penetrate into them; and those that moisten the sandy, do not stay in them; unless there be a firm layer underneath.

The most common layer under a sandy soil, is stone or gravel, and this lets the water through as fast as the sand itself; the farmer's trust must be in his manure; this must give a firmness and body to the soil, that it may of itself retain moisture enough for the service of the crop.

The creachy soil in Huntington and Northamptonshire, which is one of the blackish kinds, and is full of pieces of stone, and bits of sea shells, is manur'd with dung well rotted: and to this the most expert farmers add mud from the ditches; or they put good turfs to rot among the dung, and spread all together before rains.

The red land of the same counties, owes its colour to a redish sand. There is a mixture of very fine earth with it, but there are also lumps of concreted sand, which they call sand

sand stones: these when they break with the rains, and tillage debase the soil, while the farmer is improving it by his manure. In some places the vegetable earth is mixed with the sand in a moderate quantity, in some others, as about *Halston*, the soil is almost entire sand.

The farmer may learn from the practice of these counties, how he is to treat such lands. Where the soil is poorest in this kind, it is generally deepest: and as it works easily, they plow it deep, and bury in it old rags, and the skins of animals with their hoofs, and any other such matter; after this they spread their dung, first mixing with it mud out of the ditches. Thus they give it strength at the heart, and at the same time a body and richness nearer the surface.

When this land is very sandy, I should advise the dressing it with clay. This would make it loamy. We know the value of those soils: they consist of sand, mould, and clay. Here is the sand, and more or less mould ready, there wants only the clay; which will freely enough incorporate with the rest, and make it sufficiently firm.

The chiefly land, of our midland counties, altho' some account it a loamy, is truly a sandy soil. It breaks as it falls from the plow; and moulders with the least frost. In dry summers it is always a powder: yet it is far from one of the worst of the sandy soils. They dress it with dung alone, and it yields good crops.

Upon the whole, I should propose a mixture of soils for all these sandy lands. They want body or firmness; and this may be given them by clay, or by richer earths, spread over them in the way of manure. This would be following nature's course, and mixing up ingredients as she does. This method might be called making, rather than improving a soil.

Sandy soils in a wet season, succeed well with wheat, barley, or oats: but as this success depends on the weather, the husbandman, unless he have very well improved them, must take his chance. The finest and best tasted turneps also are those which grow on these soils. They are not only well flavoured but sound; worms and other insects which destroy these roots, love a moist earth where they can burrow, and lie at ease: they are burnt up in these soils.

Potatoes thrive in sandy soils; and none are so fit for carrots: pease, vetches, and lentils, also thrive in these soils exceedingly: and so do the foreign grasses, *faintoin* and *lucerne*.

lucerne, which are natives of warmer and drier countries than ours.

In respect of corn, the success will altogether depend upon industry. No soils stand more in need of improvement, but they never fail to return the expence bestowed on them tenfold.

For pasture grounds, a sandy soil succeeds in proportion to the degree of vegetable earth among it: the poor red land of Northamptonshire, yields very sweet grass; but not a great deal of it, except in proportion as it is improved by manures. When there is a due mixture of earth, and the farmer adds his dressings of rich dung and mud, none succeeds more. Some of the finest pastures in the world, are to be seen in Oxfordshire, and the soil is generally a yellow sandy one, but with a good large proportion of vegetable earth; and the farmers keep it rich by frequent dressings.

In Worcestershire they have this soil frequent in pasture grounds, and there is a layer of gravel underneath. They have sweet and fine grass, and it grows moderately full; but in dry seasons it burns up. However, it quickly recovers itself on the least rain. They dress it with dung in a coarse way: if they were more careful in that respect, they would have a much larger produce.

In Lancashire they have a sandy soil, which they call foxglove earth. It is a tender brown mould, full of a sharp sand, and with little other mixture than a fine vegetable earth: this affords them good pastures. In general the grass is sweet that grows on these soils.

With respect of trees, the sandy soil is not fit for the larger growths; but the beech succeeds tolerably in it. And the hazel, the holly, and some others of the shrub class, will hardly thrive in any other; for the rest it wants body. It may be proper to raise seedlings which are to be transplanted to richer soils; but otherwise it is of little use in that way.

CHAP. XVI.

Of gravelly and stony soils.

THERE is a great difference between what is properly called a gravelly soil, and a bed of gravel.

Gravel is frequent at small depths, and sometimes is seen at the surface: naked, and without any mixture or covering of earth. Gravel is a quantity of flints and pebbles. These, when

when they make the upper surface, lie in the place of a soil, tho' they cannot be called a soil properly. They can afford no nourishment for plants, nor do any grow wild among them, except upon the sea shore some few that have roots so long as to penetrate into the ground underneath.

Such a covering of the earth, compos'd of flints and pebbles alone, is gravel: but a gravelly soil is a composition of mould, sand, clay, or some other substance with gravel.

This soil is distinguish'd into several kinds, according to the nature of the earthy matter mixed with it; as clayey gravels, loamy gravels, or sandy gravels: they might add marly gravels; for I have observ'd in Huntingdonshire, a soil compos'd of a sandy marle and gravel, with no other admixture.

This turn'd to little account in the hand of the farmer who rented the land, for he did not know how to dress it. The rains wash'd down the marle to the bottom of the bed, in a few weeks after every plowing, and the gravel remain'd naked; but I am convinced had he dress'd this land with a clayey loam, it would have given it a body: the marle would have blended with the dressing. A new kind of soil would have been made, not unlike what they call a stony loam in some counties, which I have seen very fruitful.

These soils consisting of gravel and earthy matter, are better or worse, as that earthy part is in a greater or lesser proportion. There is something also in the kind of earth, but the gravel is so entirely barren, that the great difference lies in the proportion.

When gravelly soils are very poor, it is almost vain to try to improve them. When they have any tolerable mixture of mould, it will help to detain the manure, be that what it will; but when there is little, the dressings wash through them.

In some places the gravel of these soils, consists wholly of smooth round pebbles, and in others there is a mixture of irregular stones among them. In many places there are lands where the soil is compos'd altogether of these irregular stones and mould, without a single pebble or flint among them. Through carelessness this is called also a gravelly, tho' it is really a stony soil, these lumps being broken pieces of lime stone, or other rocky stones.

This is a better soil than the other, because there is a warmth in the nature of lime stone; and the pieces being of irregular shape, mix better with the mould, and remain more fast in it than the pebbles.

The soil called in Bedfordshire kealy land, is of this kind; and is tolerably fertile. Barley succeeds very well upon it. They manure it with common dung, and it takes and retains that dressing very well, always keeping its condition tho' full of stones.

Clayey gravels are a tough and disagreeable soil. The pebbles break the substance of the clay, and give way for the rains to come in, and for the roots of plants to penetrate; but there wants a mixture of earth for the support of the growth.

These are best manur'd with marle, but a right kind must be chosen. It should be the light brittle marle that moulders to powder in water. The large stones should be pick'd off these lands, and this dressing repeated at convenient times. With this assistance few soils exceed it in fertility.

Loamy gravels are preferable to the former; they are a mixture of clay, sand, fine earth, and pebbles: the larger stones are to be pick'd off from these, and the land is to be dress'd in the same manner as the poorer sort of loamy soils.

Sandy gravels when best, are but indifferent soils, that is, when there is most fine earth mixed with the sand and the pebbles; but when they are poor, they are hardly worth cultivating. The rain washes the sand down among the pebbles, and the manure goes with it. The soil thus gets into the condition of a native and haked gravel.

If the farmer have such land upon his hand, he must be at a great deal of expence, before he can expect any considerable return. The reasonable way of going about an improvement, is first to make a loam of the soil, and then to enrich it with dung and other materials.

To this purpose he must begin by dressing it with clay. This he must incorporate well with the sand and pebbles, and after this he must dung it well; or if marle can be had, that will be an excellent dressing.

This will bring it to be fruitful, but this is a work of time, and it rather makes a new soil than improves the former.

In Oxfordshire they have sandy gravels with a small mixture of earth, so that they hardly stand the effect of heavy showers: these make them often look at the top like a bare gravel.

When the farmer undertakes such a piece of ground, he first folds his sheep upon it in winter, and sprinkles it with hay-seed among the dung. If the folding be not sufficient, he adds some fresh dung, or old straw or thatch. Sometimes
with-

without folding at all, he spreads common dung, or the bottom of an old hay-stack : in this latter case, he trusts to the hay-seed that is fallen from the stack, but if it be only dung, he sprinkles hay-seed with it.

If these lands have no sward upon them before they are fallow'd, they will bear a great quantity of weeds, but a very slender crop of corn.

They fallow in autumn or winter as the sward directs them. If it be a winter fallowing, they never stir it again till they plow it up to sow with barley, and experience shews this practice does better than finer tilling. After this the soil must be kept well in heart with manure, but if that be done, it will yield good crops. When worn out, they lay it down with clover or ray grass. In some places they fallow this kind every other year, except they sow pease upon them.

If this land be full of weeds, the farmer begins with fallowing it at once, and afterwards proceeds as before.

I don't give these as the very best methods: but I have seen them practis'd with success. Those before laid down, as they are founded upon better principles in reason; and confirm'd in the same manner by tryals, deserve the greatest regard. In fine, the business with a gravelly soil, where it is poor, naked, and hungry, is to give it earth, and afterwards when a soil is in this manner made, to improve it by enriching manures.

In Bedfordshire, where they have some clayey gravels, they dress them in a way different. Their manure is chalk, and they blend this well with the soil by frequent plowings. Experience shews this to be no bad method, and upon a fair comparison between the crops of these lands, and of those of a like nature dress'd with marle, the difference appears to be this: that the effect of the marle is greater at first, but the effect of the chalk is more lasting.

Some think that the effect of chalk, tho' it lasts so long, is fatal to the land in the end; but this is a mistake. It is owing to their not knowing a proper management at the end of that time,

The strength which chalk gives to a clayey gravel, tho' it lasts a great while, does not hold for ever: but is this a wonder! Land dress'd any way will wear out at last. When it comes to this, let it be laid down for clover or ray grass; and afterwards proceed as before directed.

In general, gravelly soils need less plowing than others. Those of the clayey kind, demand more than the rest; the sandy

sandy very little. They are all forward soils: the sandy gravel pushes the growth as much as any whatsoever. It requires a great deal of care in dressing; but when that is done, it answers very well: it is a light sweet soil, and is hurt by much plowing.

The expensive dressings brought from London, such as horn-shavings, coneyclippings, and the like, lie a great while in these soils, and continue their efficacy. On the other hand, the folding of sheep takes the quickest effect, but it is the soonest exhausted. The farmer who attends to this, will see there is no giving a general advice on this head, but that he must consider his own situation, as well as the condition of the soil. One manure may be proper if he be like to hold the land a great while, another if his time be uncertain.

Where the gravel is sandy with a little clay, the best dressing is pure soft mud from the cleaning of ditches: when the clay is in a greater proportion, marle is better; and when yet more chalk is to be used. The circumstances in these cases vary by small degrees: we would give the practical farmer advice in all: and had rather be superfluous than deficient.

The fruitfulness of a gravelly soil when rightly manag'd, is surprizing. Few lands produce better crops of wheat, and it is often a strange sight to see the corn growing thick, where there seems to be nothing but pebbles: there is earth at a little depth, and the roots of the corn are fix'd in it although their stalks stand up among the stones. When a soil of this kind is well manag'd, the manure proper, and laid on in a right manner, the rains wash in all its richness, and the roots have it: in the mean time the gravel which seems naked above, defends those roots from being burnt by the sun, and keeps a continual moisture, in some degree like what is seen under a stone or board that lies on the ground.

Stony and gravelly soils have this advantage over all others; when they are brought in other respects to a level with them.

The gravelly soils in general, produce a sweet grass in pasture grounds, and when dress'd with mud, dung, or marle, will yield it in a fair quantity: but the farmer is to take notice, that there is no soil for pasturage which requires more care; otherwise, however good at heart, it may deceive his expectations.

The manure of pasture grounds on a gravelly soil, should be a mixture of mellow dung, pure ditch mud that has little

de or no sand in it, and the bottoms of old haystacks. This should be spread at a season when there is a prospect of rains.

Trees succeed in this soil rather in proportion to what is underneath it, than to the soil itself. The beech often grows well in it, and the ash. In some places the elm; but not universally. The farmer need never be afraid of trees in these light soils hurting corn; for they seek their nourishment at a greater depth.

CHAP XVII.

Of chalky soils.

AS there are naked sand and gravel on the surface of the earth; there is frequently naked and almost pure chalk. There are parts of England in which the farmers are at the expence of cultivating this; the rent being low: but this is not what we mean by a chalky soil. We express by that name a soil in which chalk is a principal ingredient; but where there are other earthy substances mixed with it.

A chalky soil discovers itself to the eye: its whiteness cannot be mistaken. There are white clayey soils, but these look darker for rain; whereas the chalky lands appear the whiter for it. There is also a greasiness in the look of the clays of this colour, which distinguishes them from the chalk.

Chalky soils differ more in their several kinds than any others. In those the difference arises from the matter mixed with the main ingredient; but in these the principal substance itself differs greatly in various places. Gravel is gravel, and sand is sand, whatever is mix'd with them: nor is there much difference between the gravel of one place, and the gravel of another; but chalk varies greatly in its nature and qualities. There is some as hard as a stone, and others as soft as marble.

There is chalk to be met with in England, from the hardness of a good firm stone, such as requires a smart blow of a hammer to break it, down to the softness of marble, that may be crumbled to pieces in ones hands: now, as these soils in some places may have one of the hard or stony chalks for their foundation; and in others, may be composed principally of the soft kind: this makes a great

a great difference in their nature, and in the management they require; independently of the other matters in the mixture.

It is necessary to name these differences to the farmer, and he must regard them nicely; otherwise all our instruction will answer no purpose. One chalky soil will be little improved by that method, which in the greatest degree enriches another.

As the chalk is harder in these lands, the soil is the worse: it is always better as a softer chalk is in the composition.

Soft chalk is frequently in these soils, mixt with a fatty and somewhat tough substance, which converts it into a kind of marley earth. This is really a mixture of a greyish clay and chalk, and this is naturally the richest of all the chalkey soils. It is also the easiest work'd.

A few plowings do on this kind and a little manure. They have it on the sides of hills in many places in Bedfordshire, and the adjoining counties: where they dress it at a small expence, and it produces great crops.

When the soil is of this soft kind, it is to be plowed deep, but not often: on the contrary, the harder chalky grounds are to be plow'd but shallow.

Chalky soils are the least of any, except sand, over-run with weeds. What they principally produce are poppies, May weed, and a few other of the slight rooted and annual kinds. The poorest of them are easily got into order; and what is spent on them in manure, is in a great measure sav'd in labour.

In Oxfordshire they throw this land up in ridges; and they are right. The farmer of another county laughs at them, supposing they do it for dryness, which is not needful. But their forefathers who invented the practice did it for warmth: and their descendants who follow the same course find the advantages, though they don't know the reason.

When it is of the harder kind, they dress it with half rotten dung; and when of the softer sort, they lay on fine mud, and a little well-rotted mellow dung with it. This melts into the soil with the rains, and gives it a surprizing fertility.

What

What they call in many counties a malmy, or maumy soil, is one of these chalky kinds: it is composed of a soft chalk, and a white clay with a little sharp sand. This makes it soft and tender: for the white clay is not tough, and the sand makes the whole more brittle. It falls to pieces in plowing, so that it needs but little of that exercise: and it crumbles with the least frost.

This soil is by nature in the condition that many other of the chalky ones are brought to by dressing: and the farmer seeing the fruitfulness of this, will know he cannot do better with many of his leaner chalky soils, than to bring them as near as he can to the condition of this: adding by art what they want in nature.

This soft chalky soil is to be laid in ridges for dryness, and for warmth. It requires less manure than many others. And the best is rotten dung.

The lighter and looser a chalky soil is, the less plowing it requires: and if the farmer would give it more than needful, supposing it will still do good, he will spoil it. Too much plowing in these soils is as mischievous as too little in the clayey. If these be broke too fine, they will not have a sufficient body to support the roots of the corn, but it will fall down with the least wind, and be destroyed.

For chalky soils in general no kind of dressing is so good as that which is given by folding sheep upon them: this is a manure that quickly gets into land: and this light soil the most readily of all receives it; and has body enough to detain all its richness.

In this practice the continual treading of the sheep presses the ground, and give it a firmness which all these soils want.

In Oxfordshire they plow in old rags, by way of manure, upon the poor chalky soils, with great success.

When the chalky soil has a mixture of a tough clay, it becomes one of the most binding earths the farmer has to do with. The manure for this land is well rotted dung, with peat sand among it: this gives it a shortness with the richness; and makes it work easy, and bear well.

In Hertfordshire the advantage of foot is so well known, that there are few soils on which they do not use it. They find it a very rich dressing for the poorest of their chalky lands.

They

They also use here the Oxfordshire manure of old rags; but they lay them on differently. They don't plow them in as in that county; but first chop them to pieces, and then sprinkle them over the ground by hand. The rains soon rot them, and carry in their very substance to the soil, where it proves a rich manure. Twenty bushels of foot will go as far as five hundred weight of rags; the effect of the foot is quicker, but that of the rags is more lasting.

The best crops on the chalky soils are wheat and barley. In Oxfordshire they make this constant difference between the clayey and the chalky soils: on the first they sow beans after wheat, and on the latter, pease.

The farmer must have a constant regard to the weather, when he is about to sow his chalky soils. It is of great importance to sow in a fair and settled season: rain falling soon after the sowing, will bind some of these soils so hard, that the seed will be lost.

Oats do very well upon these soils, but not like wheat or barley; and of the two last the wheat is the most to be depended upon. The barley that has grown upon chalky lands, is prefer'd by the maltster to that of any other soil whatsoever; but this is a crop that does not make the certain returns, he that chuses it must stand the hazard; for sometimes it fails strangely.

Rye succeeds on a chalky soil properly dress'd: no where better.

It is not only pease that grow so freely upon these soils; they agree in a particular manner with all the pulse kinds. Tares and lentils will grow well upon the very poorest of them.

No soil better nourishes the tender grasses; clover does not do well except upon the richer kinds; but saintfoin, and lucerne to admiration, particularly the saintfoin whose long root pierces to a great depth, and will therefore find moisture and nourishment, when all is dry and parch'd at the surface.

Chalky soils are not the most favourable for large growths of hay; but they furnish a sweet kind of pasture; and the better sorts when dress'd properly with mud and rich dung, will afford fair and tall grass. But it is a soil naturally found in hilly places, and that seems destin'd by nature for the plow: rather than for the growth of trees or grass.

C H A P. XVIII.

Of mellow earth.

WE come in the last place to the consideration of that soil which is called mould, or mellow earth; the richest in its own nature of all; and needing less dressings than any other.

As chalky soils are naturally found on hills; the seat of this is in low grounds; and as those seem destin'd by nature for the plow, these are in the same manner for pasture.

And there are several kinds of this soil, although they have been less taken notice of; and some of these which are found on higher situations, and admit the plow, yield large crops of corn.

Mould is found in its most pure state under the turf in fenney countries: there is neither clay, stone, nor even sand amongst it there. In other places it is mixed in a greater or lesser degree with one or other of these.

Properly speaking it is to be called mould only, in this state, as gravel, chalk, clay, and the rest are called by those names when they are pure: and as they when mix'd with other ingredients make the gravelly and other soils named from them; so when this mould is mixed with clay, sand, or the like, it constitutes many of the ordinary kinds of soil. These are not called mouldy soils, but mellow earths. So custom has established.

It is only when mould is in the greatest quantity, that these mixtures have the name of mellow earths: when sand is abundant, the soil is called sandy; when clay, it is called clayey. The mixture of mould when small, does not give a name to the soil; but converts the naked gravel, or pure clay, or the rest into soils.

We have spoken all along of a pure vegetable earth being mixed with these several ingredients in the formation of soils. This mould which is the foundation of the mellow earths, is that vegetable earth. It is scarce ever found pure: but there are places where it is sufficiently near purity, to give a full knowledge of its nature.

Gardeners desire to have vegetable earth pure; and on this occasion they seek for it in old will ows, and other decay'd

cay'd trees. What they find in these places they call virgin earth, it comes the nearest what we mean by pure vegetable earth : and we meet with mould in some of the fenny countries very like this in all respects.

In Lincolnshire their fine fen land is of this soil. A fine black mould lies under the turf in a bed of considerable thickness. It is light, loose, and black, and one scarce perceives any other mixture in it but a little sand : it is spongy when wet, and when dry it easily moulders to powder.

Some imagine peat to be the natural surface of fen lands, but that is owing to their unacquaintance with the matter. The right turf or peat is composed of decay'd stalks of plants, and other vegetable substances, with a bituminous matter that holds them together : it lies at some little depth ; and this fine black mould in the rich fenny lands lies over it, and immediately under the fward.

No soil is so fertile as this fen land, and it is owing to the excellence of this soil, which consists of scarce any thing but vegetable earth. Too much wet affects it greatly : and as it lies usually in low places, it is very subject to this inconvenience ; otherwise it would be preferable to all other soils.

In some countries, where this soil is frequent, they call it moory land ; and they value it very highly when it can be preserved from wet.

This is the pure and perfect soil of the fens. But beside this, there is another mellow earth in the same situation, which they call fen land.

This is composed of the fine black mould, and a tough blackish clay. It is black and soft : and has at a distance very much the appearance of the other. This is next to the moory land, the richest soil that is known for pasturage. It needs little manure, and in most places nature takes care of that article. It generally lies in the reach of being overflow'd by the rivers, when swelled by land floods ; and as this water stands upon the lands some time, it leaves a fine rich mud at its going off, which serves in the place of manure : and is better spread and let into the ground by the water wherein it is brought, than it could be by all the farmer's toil and ingenuity.

We read of the river Nile in Ægypt overflowing their low

low lands, and leaving its mud, which saves the farmer's labour, and occasions the great fertility of the soil. The same thing in a lesser degree happens in these fen countries after every inundation.

The fen land when dry, is tolerably firm and hard ; and it then looks of a somewhat paler colour : when wet it is blackish, and it is then soft and mellow, but with some toughness. It has also a smell at this time like the mud of a pond in summer, when the sun has newly dried up the water. This soil is more apt to be wet than the moory land, because it has a deep bed of clay at the bottom, and has too much clay in its own composition to part with water suddenly.

It is singular, that in the fen land there is no sand. This is an ingredient almost universal in other soils ; but in this there is not a grain.

This soil sometimes is met with in higher pastures : but it is never so fruitful there, though it be evidently the same in its nature and composition.

I have particularly taken notice of this about the edges of the fens, where the same soil which has run under the turf in a low meadow, has been continued through an adjoining pasture which lay a little rising. The pasture in this case never is so rich as the meadow. The reason is certainly, because the pasture ground lies out of the reach of the land floods, which, running over the other at times, leave their mud upon it.

The farmer may learn by this, what he is to do with a pasture which lies somewhat high, and has this soil. He is to dress it with mud from the bottoms of rivers or ponds, spreading it thin before rain ; it is thus nature enriches these lands by the overflowings of the neighbouring rivers, and in this manner art may imitate her proceedings.

Mud thus wash'd into the fen land soil, makes it more and more like the moory soil, which is the richest of all others.

We have mention'd a soil, which in Northamptonshire they call henmould : this is common in the richest pastures of that and the neighbouring countries, and is little other than the moory land taken out of its low situation. It is blackish, light, and fine, and is compos'd of the same fine black mould with the other, only there is more sand in the composition.

We find this soil in its greatest perfection, in those pasture grounds that lie toward the bottoms of hills. The farmers do not chuse to plow this; for it wants a body to support the roots of the corn.

In Lancashire they have a soil which they value exceedingly for its fertility, and which they call the black soil. It is composed for the greatest part, of the same fine black mould with the moory land, but has a larger proportion of sand, and some clay among it. To speak exactly, the black soil of Lancashire is composed of the mould and loam: in this it differs both from the moory land and the fen land. For the first of these has some sand in it, and no clay; the other has a great deal of clay and no sand. This having both, is of a different nature.

The black soil in Lancashire is not only rich in meadow and pasture ground, but in corn lands. The clay gives it firmness enough to support the crop; the want of which is the occasion that the rich henmould of the other counties before mentioned, cannot be used for corn.

They have there also a rich earth which they call the foxglove soil. They are not exact in these names; but I shall endeavour to explain them, to make the farmer of one country understand him of another.

In Lancashire they give the name of foxglove earth to a sandy soil of a brown colour, and tolerably rich; but in some parts of that county, and throughout Cheshire, they call an earth by that name, which exceeds the other in fertility. This is a mellow soil composed of fine mould and a considerable quantity of loam of a redish colour. These two distinct soils are frequent in Lancashire, the first in the low grounds, where it appears much the same with the moory land, and the other in the pastures on the sides of hills.

The fine and rich foxglove earth of those counties, is a very rich soil for pasture grounds: the grass is sweet, and in great quantity.

We before mention'd an earth which in some other counties they call henmould, and which is different from that known by the same name in others: this is of the nature of the foxglove earth, it is a composition of fine black mould, a good deal of clay, and a little sand; or of black mould, and a clayey loam. The white streaks they find in this on first opening it, are the first shootings of mushrooms: what gardeners call the spawn. The pasture

ture grounds of this soil bear great quantities of these : and it is no wonder this spawn is found under the surface.

This henmould soil will bear corn, tho' the other will not : it agrees with the foxglove earth in its nature as well as appearance : having a sufficient quantity of clay in it to hold the root firm.

The several kinds of mellow earth being distinctly known from one another : it remains to give the farmer the necessary instructions in what manner he is to treat them to advantage.

He will see by what has been said, that as many other soils are naturally calculated to bear corn, these are suited for pasture.

They will all produce good grafs : there are one or two of them that may be made to answer for corn ; but the generality are not fit for that use ; nor should a soil be forced by the farmer.

If he happens to have an over proportion of plow'd land to pasturage in his farm, so that he cannot raise a supply of dung for the needful manure : in this case it will be necessary to lay down part of his arable to pasture : and if the pasture land be so much, that there is more dung produced by the cattle than he can use on his fields, it will be prudent to convert some of it to corn land. For it is always his interest, as nearly as he can, to keep up this proportion.

If it happen that his pasturage be principally of this mellow earth ; he is first to examine if it be of one kind throughout, or if there be a variety.

The latter is usually the case ; and supposing it so, let him chuse out the piece that shall be plow'd according to the account here given of their natures.

Mellow earths are all so rich, that they will supply good nourishment to a crop of corn ; but the greater part of them are so loose and crumbly, that they will not support the crop in its place. They will never settle enough to the roots of the corn to keep it steady whilst it is growing : and when it is not firm it can never thrive.

This is not the only objection, the finer kinds are apt to be wet, they generally lie over a bed of heavy clay ; and almost always in low situations. The consequence is, that though they abound with nourishment, it is

E 2

of

of too moist a kind, and feeds the leaf rather than the ear.

In Cheshire, where some fields of this soil at the bottom of hills, have been forced into corn lands; the farmer has expected great profits at first, but the nourishment goes to the stalk: it is over rank in the straw, and lean in the ear.

We here advise the farmer as before, not to be too fond of converting this soil to arable. But if there be a necessity, let him take the following method.

Let him chuse out of all the kinds in his ground, that which has most clay or loam in the composition; for this, altho' it succeeds by so much the less in pasture, is the only one fit for corn: it is the only kind of mellow earth that will close enough about the roots to support it upright and firm. Thus he will take the piece that is least valuable for pasture; and at the same time that which is best for the corn.

Let him also chuse such a piece as lies somewhat rising; because the abundance of moisture is a great cause of that rankness in the stalk; and those mellow soils that lie on the sides of hills, are never so damp as those at the bottoms; the water draining off from the one, and running to the other.

This rule falls in with the other: for the mellow earths on rising grounds are always more clayey or loamy than those which lie flat. This is the consequence of the situation: the fine mould is continually washing off from the one, and coming down upon the other.

When these soils are forced into the service of corn, the best manure is rich dung. It is not easy to mend the texture of a loamy mellow earth; therefore all the farmer is to do, is to supply the richness of the soil, as it is exhausted by his crops.

In Leicestershire they dress these lands with marle to good advantage.

The same soils in Lancashire they dress with lime and soap-makers ashes; the farmers there supposing it too cold in its nature: this practice is not without success; but the other way with marle upon equal terms, I have always found had the advantage, both in present profit and in lasting.

In Lincolnshire they plow hare skins, rabbit skins, and old rags into these soils, when they dress them for corn on the sides of hills.

Woollen rags are as good as linnen. There is a famous instance in Northamptonshire, of a man's dressing a corn land on a soil not unlike one of these, with taylor's shreds
steep'd

steep'd in urine ; the consequence of which was such a crop, as scarce ever had been seen.

This is a well attested fact, all the country talk of it ; and it may recommend to the prudent farmer, a manure which he may have at a moderate expence from London, and which is likely to answer so greatly.

Having consider'd the manures that are proper for mellow earths, when used for corn ; it remains to recount those which are most useful for it in pasture. I have already said this wants less dressing than any other soil ; but the best may be improved by some manures.

Let the farmer first examine the particular kind of the soil.

If it be a mellow earth, with a good deal of loam, let him imitate the course of nature in enriching it ; and spread upon it the mud from ditches and rivers.

If it be a mellow earth, with an over proportion of clay, such as the fen land, where there is no sand in the composition, it is to be dress'd with rotten dung, mix'd with the cleanings of the highways, which are of a sharp sandy nature. This will by degrees break the firmness of the clay, reducing it to a kind of loam.

These soils may also be improved by dressings ; consisting of earths, or soils of other kinds. The moory land of Lincolnshire might be converted as it were, into the black soil of Lancashire, by dressing it with a brittle loam, as that would mix both sand and clay in the composition ; thus it would be made fitter for the plow, if needful to put it to that use.

The henmould of Northamptonshire might be made fit to receive and sustain crops of corn, by dressing it with a clayey loam, which when well mix'd in with the plow, would give it firmness.

This is considering manures in a light in which they are not sufficiently regarded by farmers. The common way of dressing with dung, is enriching, but this is making a soil.

The moory land, is liable to great damage by wet. The remedy is burning the land : this is practised to great advantage in the fen countries ; and may be introduced elsewhere.

The moory soil, as it most wants this improvement, succeeds with it most readily of all ; burning freely, and the herbage on its surface kindling easily.

In Lincolnshire they plow up the soil as shallow as they can, and pile it up in little heaps, laying some furze bushes, or pieces of peat earth here and there among it, when it is burnt

burnt they spread about the ashes, which greatly enrich the land : it becomes drier, and in all respects better than before.

The trials of reducing this pasture soil to arable, have seldom succeeded : after a little time the farmers have been glad to lay it down to grass again.

In this case the last crop sown upon it should be wheat. Because in that case the ground will gather grass before the wheat is cut : and the stubble is of use in manuring it.

Tho' these mellow earths do not succeed well with corn, there are other crops for which they are plow'd to great profit.

Coleseed will thrive exceedingly upon the mellowest of them all. They frequently plow up the moory land, which is all black earth, without almost any other ingredient for this purpose, and it yields vast crops.

The principal manure they use for the lands on which they raise this crop, is the burning of the fods. They find coleseed always thrives better on a fresh land than any other : but it will succeed very well on the same land again, after burning the stubble.

This is the only use the stubble coleseed is fit for ; they never plow it in, for it is so hard and sticky it will not soon rot.

Oats thrive also well on the richer kinds of these mellow earths. As the coleseed does best on fresh land, the farmers in Lincolnshire, when they have had one crop of that, sow oats the two or three following years. These answer very well with a little manure. They sometimes sow wheat or barley after the coleseed, but it is not so sure of success : in a dry year it is often destroyed by tumbling down from the loose nature of the soil ; and in a wet season the ground becomes so damp, that the growth is rank in the stalk, but poor in ear.

After three years oats, upon a year of coleseed, the custom is to lay the field for grass. For this purpose they sow ray grass with the last oats. When it has been kept thus six years, they plow it up slightly, and burn the fod, after which they sow it with coleseed again.

The fine mellow earths are not favourable to the growth of trees. One reason is, that they want firmness to hold the roots, another is the great moisture.

In the purest kinds, such as the moory land, we see scarce any tree except the willow.

As these earths partake more and more of the nature of the

the other soils, they will support other trees. When this land gets a small proportion of loam, the white poplar grows freely upon it : and the foxglove earth of Cheshire, and some of the mellow earths of Northamptonshire, bear all the common kinds of trees in sufficient perfection.

Trees grow quickest in a rich, but are firmest in a strong soil. The oak grows tediously in the clayey grounds of Northamptonshire, but its wood is found in proportion.

This is not an observation in favour of these mellow soils for trees : we lay it down as a caution to the practical farmer, that he make no attempts of that kind. Every soil has its natural produce : and so far as convenience will allow, that should be followed ; for whatsoever is the growth to which a soil is fitted by nature, the same is that with which it will best succeed under the improvements of art.

The end of the FIRST BOOK.

Of the uses of clay, loam, sand, and other substances found on or in the earth, in the various arts ; and their value to the owner.

THE INTRODUCTION.

HAVING consider'd clay, sand, and the like, as they enter into the composition of different soils ; we shall here enquire into their nature and uses in their separate state.

They often lie on the surface of the earth, or make its uppermost covering in this condition : in that case they are not called soils, though they take the place of a soil ; and they are frequently not worth the expence of dressing.

But tho' they do not come under the farmer's consideration in this state as soils ; yet making a part of his land, it is fit he should understand their value.

To enquire into the several uses of substances found under the surface of the earth, would be foreign to the purpose of this work : but so much as may concern the farmer or the country gentleman, shall be inserted.

We propose to inform the possessor or cultivator of land, whether owner or tenant, of all things it can be useful to him to know respecting it.

'Tis therefore we enquire into the occasional uses of clay, and the other substances; and it would be leaving the possessor in the dark in a material article should any thing of this kind be omitted.

CHAP. I.

Of the uses of clay.

THE farmer who finds clay on the surface of his land, needs not despair of advantage. Though it may not be worth the charge of culture, it will answer other purposes: these shall severally be recounted.

Let him first enquire of what kind the clay is, and of what nature. The red and yellow, are the most frequently found at or near the surface: the black and the white clay usually lie under the soil, or at greater depths.

When these are altogether pure at the surface, he may begin with them there; but when they have some mixture in that part, the red or yellow clay will probably be found quite pure and entire at a small depth, and that in so thick a bed, that a pit for it brings great profit with very little expence of labour.

The red is the most valuable, as it answers not only the best purposes, but the greatest number of them. It is not of a perfect red colour, as the name usually given it seems to express; but brown, with a cast of redish. It has the name of red by way of distinction from the yellow.

Nothing is equal to pure red clay for securing the bottoms of ponds for holding of water. Whether the soil be gravelly, sandy, or whatever, if the bottom be lined with red clay well rammed, the pond will hold for many ages, as if it was dug in a bed of the clay. The compleat method is this, first ram down a lining of red clay, and upon that lay a good pitching of stones; this makes a bottom as firm, as secure, and as durable as lead.

Red clay exceeds all others for the brewery. 'Tis beat and temper'd to a due consistence for covering bungholes of barrels. If it crack, the remedy is to beat it up afresh with brine instead of water.

In grafting of trees the red clay is better than any other: they beat it up with horse dung, and this prevents it from cracking as it dries: and with hay chop'd small, it makes a covering for sheds and cottages, instead of walls.

When

When calcin'd, it makes a fine manure. This reduces it to a powder like ashes. This is to be sprinkled by hand over the ground, and is excellent either for pasture or corn lands : it gives strength and heart to other soils.

These are the uses of red clay ; a pit of it open'd in a convenient place, may be of great value to the proprietor himself, and may afford considerable profit by the sale.

Yellow clay is nearest the red in nature and qualities, and is used for the same purposes. It is often found as pure as the red, and is then as smooth and fine, but it wants something of its firmness. Where the red is to be had, this is to be rejected as inferior ; but generally those counties which produce one in abundance, have little of the other.

When there is a want of the red, the yellow is to be used in its place, but there must be more care in managing it. It seems to temper with less beating, but in order to bring it to a lasting consistence, it requires more ; and when all is done, it is more liable to crack as it dries, and to waste upon the surface by wet.

There are many things in which the red and yellow clay agree. Either will serve for bricks : the red in particular makes an excellent kind ; of no very bright colour, but of great strength. The brick makers do not chuse to work pure clay ; it takes a great deal more labour and time to temper it for the mould ; and when it is done, it shrinks in the drying. The bricks made of it are strong, but dear.

They prefer loams because they cut and temper easier. Where these are not to be had, they use clay, but they mix it with ashes, and the dirt out of streets to give it a shortness.

When the loams, which they properly call brick earth, are not sandy enough, they mix ashes or other dry stuff with them also in the same manner.

The red and yellow clay are both used in the potteries, but seldom alone. The yellow is one of the ingredients of the common Staffordshire ware ; and the red is mix'd into the compositions for their better work. The yellow is also an ingredient in making of garden pots : it burns to a reddish colour.

The best natural clay I ever saw for bricks is in Oxfordshire ; it is a mix'd kind, partly yellow, partly blueish, of a tender nature, and with some sand among it ; this works easily, and makes exceeding good brick.

If the farmer have an earth of this kind, in the way of good carriage, it is a treasure ; no-body will take the tough clays

clays for bricks, if they can get these which are tenderer : if they are absolutely brittle it will not do : the middle consistence is what gives them their value.

It is common that where clay near the surface, is tender and brittle, there is a bed of a firmer and tougher sort underneath. These two being mix'd together often make an earth of a due consistence. For these reasons he who has a mind to make bricks upon his own ground, needs not be disheartened at the first appearance of the clay, for where there is almost any sort the work may be done. The foul and brittle kinds are the only ones that can't be used for this purpose : the others may be either wrought alone, or mended with dirt or ashes, or one kind will mend another.

We have in several places, a yellow clay with a small admixture of sand, so little that it does not give it the name of a loam. This is an excellent earth in pottery. It often lies in Staffordshire, sometimes on the surface of the ground ; and they make mugs, dishes, and a very good kind of earthen ware of it alone. It is so firm that it works well ; and it takes the glazing excellently.

The red clay being firmer than this yellow kind, one would suppose it would make a stronger ware : but I have observed the contrary. Where they work the best red clay singly into any of the tolerably fine ware, it does not take the glazing well, and it is brittle.

The toughest and finest of all the Staffordshire earths, of which they make such advantage in their potteries, belongs in some degree to the yellow kind. It is a pure, tough, and firm clay, but is not uniform in colour, being mixed and streaked with white. This they call bottle clay in that county, and value it more than any other for the body of their ware.

Thus much it may be useful to observe in respect to the two first kinds of clays, that the person in whose hands they sit, may understand their nature, and their value. That he may not overlook such as are worth his notice ; nor be drawn in by scheming persons, to undertake works for which they are not fit.

Bricks, wherever there is a tolerably good clay, may be made one way or another : as to the potteries, there is more in the mixture of different kinds of clay, than in using any singly. But it is certain that the fine Staffordshire bottle clay, which is the ground work of their pottery, is to be found

found in other places : I have met with it in Worcestershire, Leicestershire, and Hampshire.

Under the name of black clays, we comprehend all that are of a dark colour, the blueish and dingy, as well as the entire black.

The blueish black clay is the most common kind : it usually lies at some depth ; but it makes amends for the trouble of getting at it by the thickness of the bed. It is a pure, hard, and tough clay : its general use is for making of tiles, and it has thence got the name of tile clay.

There is as much toughness in this as in the red clay, but they are contented to work it without ashes or dirt, because they are paid a better price for tiles, and because they require to be stronger, as they are more exposed to weather, with a thinner substance.

There is also another reason why they work this tough clay entire for tiles. They must be made of an earth that will bend. For the ridge and gutter tiles require this, and no earth will bend that has any great mixture of sand or dirt.

The red and the yellow clays often rise to the surface in such foulness, that it is possible to cut them as clay, or to cultivate them as soil ; but it is not so with the black. Where that is so mix'd that it can be cultivated, it is never worth taking up as clay ; and where it is so pure that it may be us'd as clay in manufactures, it is very rarely worth the expence and pains of cultivation.

Beside tile-making which is the general use of this kind, they in many places work it into a sort of pottery ; when us'd alone it makes but an indifferent ware ; but being mix'd with other less compact kinds, it gives strength and firmness.

In Northamptonshire they have a clay that is quite black, and they make tobacco pipes with it : it burns to a perfect whiteness.

This is dug near the town of Northampton, and was one of the first used to this purpose in England. It is a smooth clay, free from any admixture of sand. It is very heavy, and is naturally so hard, that they are oblig'd to soften it with water to get it out of the pit.

This is so valuable, that it is worth the owner's while to regard it very carefully if his land appear to contain it. Sometimes it lies near the surface, rarely at any great depth ; and it is usually disposed in vast cakes or benches, and not in a continued bed.

This of Northampton is carry'd into all the neighbouring coun-

counties ; and is one of the ingredients in the Nottinghamshire potteries.

There is also a deep grey clay, that in the same manner burns white, and is used for tobacco pipes. This usually lies near the other ; and scarce differs from it, except in colour.

There is a black clay in many parts of England, which is as fine as these, and would make pipes, but it burns red. This makes an excellent kind of red pottery. The farmer will not easily know one of these from the other by the eye ; but he needs only put a piece of it into the fire : if it burn white it is the pipe clay ; if red, the potters kind, and either is very valuable.

As we include the blue among the black clays, we must here name another very valuable kind ; it is of a dusky lead colour, and is one of the better sorts of the Staffordshire earths. They there call it by an odd name, white clay ; but this is because it makes what they call a white ware.

The owner where this clay is found, possesses also a thing of value. He may judge of it by the colour, which is particular, but if it become of a pale yellow when put into the fire, he is sure to be right. If there be a pottery within any moderate distance it will sell well.

Last is to be named a medicinal black clay of a fine texture, which burns to a pale grey, and is good against purgings, having the same virtues with bole armenick.

The white clays are also of great use. But they differ more in their nature than the others : some of them being as tough as the pure black, and others tenderer than any of the other colour'd ones whatsoever.

We have mention'd a black clay us'd for making tobacco pipes ; but the clay commonly us'd for that purpose is white. All the tobacco pipe clay in London is white ; and the fine pipe clays of Pool in Dorsetshire, and of the isle of Wight, which are the two most famous kinds in the world, are also white.

The pipe clay of the isle of Wight, is a clean white, and very tender : that of Pool is of less pure, and of a tougher consistence. Neither of these do so well alone as a mixture of both. The pipe-makers temper one with the other till they bring the mixture to a due consistence.

The black clay of Northampton is carry'd as far as Oxford, and there used for pipe-making, mix'd with a white clay dug on Shotover hills.

The

The person who finds a clay upon his land, which has an appearance of answering for pipe-making, need not be dishearten'd, if upon getting a trial made the workmen tell him it is too brittle or too tough.

Pipe clay is a thing of value, wherever it is found, for it sells at a price that will pay carriage: and if it be of the genuine pipe kind, it may be worth money, for mixing with others faulty in the opposite extream, though it cannot be used in the manufacture alone. In general pipe clay is not so heavy and tough as the other whitish clays.

There is another kind of white clay, which the Staffordshire people call hard-fire clay: it is of a dull colour mix'd with yellow.

This does not greatly differ from their bottle clay, which is yellow streak'd with white; only in that kind the yellow part is greatest, and in this the white.

This is one of their best earths for pottery.

It is worth while to seek after these clays, if there be any probability of finding them on the land: and very often they may be discover'd, when they do not rise to the surface: if the plow cutting deeper than ordinary turn up a piece of earth of any of these colours, though it be foul and sandy, 'tis worth while to open a little pit in some corner of the field, and examine how it lies deeper. Often the best beds of these valuable earths are foul at the upper part from the soil that lies over them; though they are found altogether pure at a greater depth.

The same white clay that is used by pipe makers, is also used in some quantity by sugar bakers, in the refining their sugars. They temper it oft, and lay it on the top of the sugar pot, from whence the water soaking gradually through the sugar, carries off all foulness with it. A very fine kind of bricks may be made of the tough white clay, but few will be at the expence.

Upon the whole; he who finds a clay of a good kind upon his lands, misses a treasure if he neglects to dig it. He cannot expect to know at once, all the uses that may be made of it: but he shou'd offer it to the manufacturers of several kinds, that if it do not suit one he may have his chance with another. When he finds any one ready to bargain, let him take care how he parts with his property in the ground.

CHAP. II.

Of the uses of loam.

WE mentioned among the uses of clays, that of making bricks, but the earth of which they are principally made is loam.

Tough clays are work'd up with sand, dirt, or ashes, but the loams are thus ready prepared, so that all that previous expence is spared. Loam is a composition of clay and sand made by nature.

In some places the loam is so favourably mix'd, that it requires only to be beat together, and work'd into bricks; and this earth usually lies near the surface.

This is prefer'd for these reasons to the tough clays which are dug at greater depths, so that the first charge is more; and which are after this to lie exposed to the air several months, and then to be made up with other mixtures.

Where there is fine clay there seldom are any beds of sand near; but where there is loam, there is commonly loose sand not far off. This is another advantage, because sand is necessary in brick-making.

As bricks are intended for many uses, and are to be sold at various prizes, they are made from different materials, or at least of different mixtures: the hardest kinds are made almost of pure clay, the softest and worst of the basest mixtures, as loam and street dirt: some are so bad, that they will hardly hold together.

What they call clinkers, and use for the flooring of ovens, are made of a tough whitish clay without any mixture.

The fine pale yellow bricks are made of the same sort of yellowish white clay, with a little mixture of sand: these have four times the labour of the ordinary bricks bestow'd on the tempering them. They seldom are perfectly good unless a very large price is paid. The grey stocks come next to these.

The fine bright red brick which is used as an ornament about doors and windows in many places, is made of a pure and unmixed loam, which contains a large proportion of sand, to a small portion of clay.

Clay alone will make good bricks, but many of the finest,

finest, and almost all the ordinary kinds are made of loam.

A brown loam is commonly used for brick-making; and when a loamy soil of this colour is too poor for cultivation, it seldom fails to offer the owner this use. But as it is a very common earth, the question will be, whether the situation is likely to occasion a demand: for neither the earth, nor the bricks, will pay long carriage.

A yellowish loam is after this, the most frequent kind used in brick-making; and sometimes it affords a brick that is of value enough to merit consideration. The owner of the land where such a loam turns up, will do well to try it in the fire. A small piece will make the experiment. If it burn quickly to a high red, it will be worth a more strict trial, as it may afford the fine red brick; which is always best when made of this loam pure, tho' some use mixtures.

A blue and yellow brittle clay is common in many places, with a slight admixture of sand in it. This they make into bricks in many places, and they are much better than the common bricks in London.

In Wiltshire they use a yellow clayey marle for brick-making, and it answers tolerably well. It is tender, and works easily. The bricks are about as good as the midling sort in London.

A brownish marly clay is sometimes also used to the same purpose, and with equal success. These earths work well, but the marle is no good ingredient.

About Newcastle in Staffordshire, they make bricks of a brown loam, which burns blue. These have an odd appearance, but they are strong. The Romans seem to have prefer'd this earth to many others, using it for their urns; many of those found in Kent are of this blue colour.

Probably the earth of which they are made, is found in the same places. This is worth some regard as it is a very good kind for brick-making.

The making of bricks is one of the principal uses of loam, but it is far from being the only one. Loams of many kinds, when they are of a due toughness, are used in the potteries, and where they are not of a firmness for the body of the ware, they are used in the painting of the outsides.

In

In Staffordshire they distinguish the earths they use in the pottery into two kinds ; the first they call throwing clays, the other slips.

The throwing clays are tough, and will work upon the wheel ; these are all clays, and they make the body of their work. The slips are brittle, and these they use in painting and colouring the others. These last are principally loams, but they prepare them for use by first mixing them up in water, and letting all the sand subside, so that they take only the pure clay that was in the composition.

There is a grey earth with lumps of yellow frequent in that county ; which I have seen also in Leicestershire, Warwickshire, and elsewhere : It is a dirty loam. They prepare it as before mentioned ; and when the pure clay is mix'd up with water to the thickness of a syrup, it gives a deep yellow to their ware.

They use a blueish loam, which has so little sand that it might almost be called clay, for a paler yellow, having prepared it in the same manner. And, finally, they have a dusky reddish loam ; which, when treated in the same manner, gives the black colour.

The last of these earths is common in half the counties in England ; the blue is less frequent, but I have seen it in Worcestershire and elsewhere. All these loams will have their value if a pottery be near, and they are wanted upon the spot, otherwise they do not demand much notice.

But there is yet another loam to be spoken of ; which, wherever it shall be found, will be an estate to the owner, and also a benefit to this country. This valuable kind is what they dig at present only at the village of Hedgerly in Buckinghamshire, upon the edge of Berkshire. They call it there fire earth, and the bricks they make of it fire bricks ; this name is given them from their great strength in bearing the fire : in London the earth is known by the name of Windsor loam, and sells at ten pence or a shilling a bushel.

They call it Windsor loam, because it is sent from Windsor to London ; Hedgerly being only a few miles from Windsor.

This valuable earth is a true loam, and one of the hardest in the world ; it is of a brownish yellow colour,
very

very coarse to the touch and brittle : being put into the fire it becomes of a fine strong red.

These are the marks by which it is to be known, and it cannot be too diligently searched for ; the vein of it at Hedgerly being in danger to be worked out, from the great and long consumption. The person who works it at present has dug for it all the ground he had, and he took another acre for the same use some time since at a great price ; but on digging he has found the bed of the loam does not continue.

The use of this earth is to face the ovens at glass-houses, and for all other services where there is a great violence of fire. The chemists, refiners, and others, use it also to cover their glasses, and other such work. And the bricks made of it are the only ones to build the ovens and furnaces themselves, no other standing the fire comparably to them. The earth whether in bricks, or in the coatings before nam'd, presently turns to a fine red colour, and then will stand many years unalter'd, in places where a piece of common loam would be run into glass in a minute.

Yellow loams in general are very common : and it is highly probable, this valuable kind is produced in other places, beside the spot which now supplies not only all this kingdom, but several others, for a great deal is exported, for the purposes of glass-makers, melters of metals, and the like elsewhere.

Every harsh yellow loam may be try'd for this use, comparing it first with the Hedgerly kind, and then making it into bricks : these when properly burnt, will be as red as those soft ornamental ones already mentioned.

A bed of this earth may be discovered to the great profit of the owner ; but by frequent trials perhaps a loam may be made artificially, which will answer the same purposes. The only ingredients are a very sharp, hard, and large sand of a pale brownish yellow colour, and a yellow tough clay. If such a sand should be found in one part of the kingdom, and a clay of exactly the same kind in another, they might, on being mixed in a proper proportion, make exactly the same loam that is dug in this particular place.

Thus not only the loam of Hedgerly is to be sought in
F other

other places, but sand pits and clay pits may be searched with a reasonable hope.

In the piece of ground newly taken by the man of Hedgerly, into which the bed of loam does not run as he expected, there is a bed of yellow clay, and another of a pale colour'd harsh sand, which are evidently the two things of which the loam is composed in the other pit: and a gentleman of London, very curious in these things, assur'd me, that by mixing these together, he had made a loam altogether like the other, and of equal use.

The sand is also in some places found loose in the right old loam pit; and there are some parts of the vein which have a great deal of clay, and other parts which have very little, being almost entire sand, and scarce capable of holding together. The workmen mix all these together, and perhaps often some of the sand with them; beating up all together to a due form, which they from long experience know by the eye.

All this leads me to believe the mixture may be entirely made by art, and certainly he will be happy who finds the method.

C H A P. III.

Of the uses of sand.

CLAY is the earth employ'd to the most purposes beside those of husbandry; and the next in use to it is loam: the other kinds to be treated of, have much fewer uses than either. We come now to consider sand and gravel. These are somewhat of kin to one another in their nature.

Where bare sand or bare gravel are at the surface taking the place of soil, they are not worth culture: the owner is therefore to enquire what other use he can make of them. This will be greater or less according to the situation of the place.

Sand is used as a manure to clay grounds in some places, with good success; and this is a practice founded on reason.

Various kinds of it also are used to many other purposes, for which they are suited by their fineness, coarseness, and other accidents.

In Buckinghamshire the fine white writing sand, which

is elsewhere sold at a considerable price, is so common, that they strew rooms with it.

In many parts of Middlesex, there is a small deep yellow kind, which feels like fine powder, having scarce any sharpness. They make no profit of it there : but the same kind of sand is sold at a great price at Bilston in Staffordshire, for the use of people who cast metals.

Pure white sand is used in making the finest glass. It answers the purpose of crystal, being better than flints. Indeed white sand is no other than small pieces of crystal, just render'd cloudy by a white earth, as the other kinds are colour'd, and more debas'd in their nature by yellow or red earths.

Clean sand of various degrees of fineness, is also used by glass grinders : and the softest sorts by plumbers for making the bed on which they cast their sheet lead.

In Staffordshire they sift a kind of yellow sand, first from the dust and small pieces in a fine sieve, and afterwards from the stones, or little pebbles that are among it, in a larger ; and having thus brought it all to an even size, they spread it upon boards, and whet their scythes on it : from this it has the name of scythe sand.

It is usual to distinguish sand into three kinds ; pit sand, river sand, and sea sand.

The pit sand and river sand have no difference but this, that the river sand is well wash'd, and the pit sand has often a great deal of dirt among it. There are as many kinds of one as of the other, and of as many colours ; but this is all the difference ; for the river sands are wash'd out of the banks by the water.

Sea sand is of the same kind with that of rivers, but it has fragments of shells mixed with it, the waves washing them to pieces on the shore. In some places what they call sea sand is made up almost entirely of these. This is used as a manure.

Common sand used as a manure, can answer no purpose but that of breaking the clay : but this which is of an animal nature, operates as all the other animal substances do ; and by its saltiness.

C H A P. IV.

Of the uses of gravel.

THE great use of gravel is for walks, and the several kinds of it differ greatly in value.

All gravel is made up of small pebbles and flints, but in some there are fewer of the flints than in others : and in some beds almost none.

Some pits afford a gravel made up of roundish pebbles of a blueish red colour. These look as if they had been wash'd, having no other matter of whatsoever kind among them.

This is a kind of gravel that can never bind ; nor is it possible to add any thing, except in a vast quantity, that will make it. A walk laid with this seems composed of loose stones, and always continues uneven, and troublesome to tread upon ; neither is the colour agreeable.

In other pits we find gravel that has a great many flints, and a great deal of sand among it : and the very pebbles are usually of a paler colour. This does a great deal better for walks, because the flints and pebbles not being all round, come closer together, and the sand fills up in some degree the crevices between them.

These gravels, however, bind but moderately ; and often the sand will be wash'd away by hard rains, and leave spaces between the stones.

The best gravel is that which is composed of irregular pebbles, with a great many flints, and with a good deal of a marley loam among it. The loam is yellow, and gives that colour to the whole. It also makes it bind tight and firm, for it fills up all the spaces between the stones, and the clay that is in its composition keeps all firm, and prevents the sand from rising in dry seasons.

Gravel may be screen'd to what fineness the purpose requires : and the owner who sees to what the excellency of the best kinds is owing, may in this as well as other cases, imitate nature, and improve the others.

It is too hard to make a good gravel out of the round clean kind first named, by adding any thing to it ; but if the farmers land afford in any part a gravel that is tolerably good ;

good; and there be a demand for it, he may add cent per cent to its value by a little trouble.

If it be too apt to throw up the sand in dry weather, let him order some tough clay first temper'd soft with sand and water, to be thrown and stir'd well in amongst it: or if he have some that wants only a little more loam, let him add it freely, this will give what they want, and convert ordinary into excellent gravels.

Among gravel there are in most places a sort of large smooth stones of the bigness of a man's fist, these are pebbles larger in size, they are to be separated; gentlemen's court yards are often pitch'd with them; tho' they make but a loose disagreeable pavement.

The value of these, like that of the gravel, depends upon the situation and the demand.

In Buckinghamshire, the farmers dress their clay land with gravel. An old husbandman whom I saw strewing gravel thin over one of these lands, assured me it had been done by a neighbour with good success.

The land was a solid red clay without sand or stone, and the gravel was a very loamy sort well screen'd, so that there was not a stone so big as a walnut among it. However strange the practice appear at first, it is not foreign to reason.

The stones were mostly ragged little flints, and along with these there was a great deal of a marley loam: these flints broke the substance of the clay, and made way for the sand, which broke and divided it farther; and so let in the marle; which enriched it, at the same time the openness of the structure gave admission to the sun, air and rains.

The old farmer told me all he should do more to his land, was giving it a small sprinkling of dung toward Michaelmas; he assured me this was the method follow'd by his neighbour, who had by that means got good crops of wheat from a spot of ground, which had many years had the character of one of the worst pieces in the hundred.

Gravel is a great advantage we have over most other countries for making walks: it is from this, and our grass, which is superior also to that of all nations, that we can give a beauty to our gardens, no other people can.

In gravel this is owing in a great measure to the mixture of loam and sand among the pebbles. Other countries have

heaps and beds of small stones, but they are deficient in these admixtures which would make them bind.

But as famous as we are for gravel, it is not in every part we have it.

In some of the most western counties there is hardly such a thing to be found as a pebble: yet they have there what they call gravel. In Northamptonshire, where they have pebbles enough, they give this name to other mixtures. At Farndon in that county, their gravel is made up of flat pieces of slate stone more than pebbles; the gravel at Upton is made up wholly of such, without a pebble among them: at Ecton they call a reddish sand, with some flat pieces of a red stone among it, gravel; and at Desborough they gave the same name to quantities of petrify'd sea shells in sand. As they use these instead of gravel, they give them its name.

Gravels are yellow, reddish, brown or whitish: the first are preferr'd, but there is a particular beauty in the last kind. There are pebbles in this of pure crystal, some as clear as glass, and others whitish. I have taken up several of these in a gravel pit near the duke of Portland's; and on one have a seal engraved: it is equal to any crystal in the world.

The gravel in Kent is often compos'd only of loose pebbles. In Suffex a great deal is made up of pebbles and sand only: in Bedfordshire it is often too loamy. Walks made with this are dirty after rain, and are apt to be presently overrun with weeds. A due proportion of loam and sand, with the flints and pebbles, is the perfection of a gravel.

CHAP. V.

Of the uses of chalk.

FEW of the earths serve to more considerable purposes than chalk. It is therefore to the owner's advantage to have it upon his land any where: often it is a subject of great profit. In some counties it is scarce, others are full of it. In the first a good bed of chalk is an estate: and even in the others it has its value.

Lime is often made of chalk. It does not make the best, but it calcines the easiest, and can be sold cheap.

The use of chalk as a manure is abundantly known, and occasions a great consumption. It has been mention'd already under those soils it is best suited to improve; and will be more at large under the head of manures.

To

To know to which of these two purposes lime, or manure, the chalk is best suited, the farmer must examine its nature. Hard and stony chalks are fit for lime; and soft and marly ones for manure in their natural form: the hardest of them when reduced to lime, serve also this purpose.

Whiting, which is of many uses in the common affairs of life, is made from chalk. It is chalk broke from its hard and firm nature, and reduced to a fine powder like flower, which having been suspended in water, forms itself into cakes as that water dries away; and is fit for the use of the white-washer and others.

Chalk is valuable also on account of its qualities as a medicine. They find in chalk pits certain roundish shelly substances, which they call chalk eggs. These are hollow, and full of a chalk as fine as whiting, and altogether like it. The curious say these shells once belonged to the sea eggs, or sea urchins, as they are called, a sort of shell fish common enough on our shores; and that they have been petrified and filled thus with fine chalk ever since Noah's flood.

The chymists and apothecaries use chalk oftener than they should: those white cakes that are set up in glasses at their windows in London, with the name of pearls, and the like, are often chalk. They look very like little whiting balls; and probably they are no other. How far this deceit is prejudicial to the healths and lives of those that take them, I shall not enquire.

In Kent, and some other counties, chalk lies just under the ground, or in cliffs, so that they have nothing to do but to tear it down and use it. In many other places where they have as much necessity for it, it lies at great depths.

In some they dig wells for it, there being no water till they come to a great depth, so that they take up a vast deal without disturbance. In other places they dig for it as they do in mines, and draw it up in buckets.

They have an ingenious method in Kent, of getting down chalk where it is in the cliffs, or on the sides of hills. They undermine a parcel of chalk to a little depth at the bottom, they then go to the top and cut a small trench along, as far from the edge as the depth of the undermining: they fill this trench with water in the evening, and the effect is, that a great flake of chalk, of two foot or more in thickness, and of the whole breadth of the pit falls off before morning.

We hear of two other kinds of chalk among the painters, the one black, and the other red. These are altogether different

ferent substances from common chalk, and are found not in great beds, but in lumps: when they happen to be thrown up in digging, they are worth saving; but there is no knowing where to expect them.

Hitherto we have been considering those substances which frequently make the foundation of soils, as they are useful to other purposes beside those of husbandry. We have gone through five of these: there remains one more, that is, mould; but as the natural and immediate use of that is for husbandry, it would be idle to consider it in any other lights.

It will be proper therefore that we now advance to certain other substances, which the owner may find either by accident, or by his industry in his land, and which may be very profitable.

CHAP. VI.

Of fullers earth.

IT would be natural to give the preference over all other things here to be treated of, to marle: as it is more frequent than the others, more abundant in quantity wherever found, and more generally useful; but that will come into consideration in another place, under the article of manures. We shall here proceed to treat of fullers earth; a commodity of value, and of the utmost importance in our woollen manufactory. It is not only an advantage to the owner who shall find this on his land, but to the country.

Fullers earth is at present dug in very few places: but wheresoever it is found, the profit is very great. The nation is at this time in a manner supplied from a few pits in Bedfordshire; but I have more than once met with this valuable earth in other counties.

Let those who would reap the advantage of it, first know perfectly what it is. Fullers earth is a genuine marle, and is the finest of all the known kinds. If the price would allow, it would exceed all other sorts in the improvement of land; no other kind is so pure and free from mixture, none is so soft and mellow; and we know that it falls to powder in a few moments by the effect of water.

Tho' fullers earth will never be used as a manure, yet the knowledge of this is not without its use: for foul and coarse fullers earth is found in places where the fine and pure is not; and the owner will know how to value it.

We

We have mentioned the Buckinghamshire farmer's dressing his ground with gravel; and we have in many places found a coarse kind of fullers earth in gravel pits: if there were any quantity of it in that gravel, we see the following fertility in part accounted for on this principle.

The coarse kind of fullers earth is mostly found in gravel pits. There often lie among the gravel in different counties, lumps as big as one's fist, or of half that bigness, of a greyish coarse earthy substance. Sometimes these lie irregularly, and in some places a streak of them runs in the side of the pit perpendicular, though seldom in an exact strait line, from the top of the bed of gravel down as far as the workmen dig.

This coarse earth when examined, contains a sharp sand, and some clay, but it has a soapy softness withal, that to a person used to handle fullers earth, will be sure to bring that substance into his mind.

These lumps being put into water, they break almost directly, and they form three settlements. At the bottom there lies a sharp sand, over that is a thin settlement of yellow or brown clay, and at the top of these a loose covering of an olive coloured, light, crumbly and moulding matter, which is perfectly the same with fullers earth when broke in water. If the whole be shook or stirr'd together ever so often, the settlement always divides itself into three parts in this manner.

Now I am sure from many trials, that this upper settlement, which looks so like fullers earth in a state of wetness, is fullers earth in reality; upon this it will be worth while to make some observations.

In the first place, where should any thing be expected to be found pure and entire, but where we already see it in a more imperfect state? Therefore in whatever lands these lumps shall be found, it would be well to look heedfully all about for more and finer, in order to direct a better search by digging where there is a prospect.

Where there are beds of any kind of earth pure at some depth, we usually see the same things in a fouler state towards the surface: clayey soils lie over beds of pure clay; these soils being no other than the same clay, mix'd with other earths near the surface: and it is the same of the others.

Therefore when we find this foul kind of fullers earth near the surface of the ground in gravel pits, it is reasonable to be-

believe the same substance may be found altogether pure and entire, deeper down.

I would not advise digging in search of fullers earth wherever some of these lumps shall be found, that might be a random search : such marks of valuable things under ground, being often scatter'd to a great distance about the surface. But when the owner of a piece of land sees one of these veins running strait down a gravel pit to the depth of the digging ; it would be worth while to venture some expence in following it deeper ; and seeing in what it ends.

Miners often trace a vein of ore in this manner through the hardest rock, from the thickness of a thread till it enlarges into a great body : why should not the same success attend such a trial here.

I remember once to have seen in a gravel pit upon my own land, a vein of fine mould thus running strait down among the stones. This did not begin small and increase in bigness : on the contrary, it was widest at the top or surface of the ground, and grew smaller all the way. I had seen these before in other places where I had no right to dig ; but here I ordered it to be followed. At about thirteen foot it terminated in a thick bed of garden mould. The whole descent seem'd to have been a kind of funnel, through which this mould ran into the hollow underneath, filling it up, and forming a layer of mould, a thing very unusual at that depth.

I mention this to shew how well such a vein of fullers earth, if one should be met with, would be worth following. We know nothing of the ways by which people were led to the knowledge of those beds that have so long been dug for fullers earth : perhaps it was in some such manner.

If the farmer would frequently follow the plow with his eye, he would find great advantage.

There is more reason to expect fullers earth in other places, beside those where it is at present dug.

At Wendon in Northamptonshire, there is found in many pits, an earth of an irregular and mixt colour, yellowish in some places, and blueish in others : this breaks in water just like fullers earth, and takes spots out of cloaths, as the people every day experience. It is not pure, nor does it seem of quite so scouring a nature as true fullers earth : but it comes very near it, and serves in its place for ordinary purposes.

Blue and yellow mix'd make green. These dingy earths therefore would when mix'd, make an olive colour ; and if pure,

pure, they would more resemble fullers earth. This is not the only place where I have seen this foul and half-mixed earth: is it not very probable that the same earth more pure and better blended is to be found a little deeper? Such would be right fullers earth; but no-body has dug to try.

Dr. Plot in his natural history of Staffordshire, says, that near Statfold in that county, he met with fullers earth very much like that of Bedfordshire, but in little quantity. Now if some broken masses of this lie near the surface, who will doubt but there are more at greater depths? Probably there are beds of it there, and in the other places I have mentioned, and there only wants industry and spirit to open the way to a fortune.

I would advise the land owner and farmer for the future, to make themselves well acquainted not only with fullers earth, but with the several others to be named hereafter, by the sight and touch; that they may know when any thing like them happens to be thrown up: they are not to expect to find any of these pure and perfect near the surface: they can only find coarse pieces there which may tempt them to seek farther; this is all nature gives for their information.

C H A P. VII.

Of ochre.

OCHRE is an earth used by painters; and is of considerable value. Many fine kinds of it are produced in England in large quantities. It is an estate to the owner wherever it is found; and it is to be dug in many places, where at present the possessor of the ground has no such expectation.

Ochre is of several kinds: but the two principal are yellow and red. A great deal of the yellow is converted into red by burning, for all yellow ochre grows red on being put into the fire; but beside this, there is a natural red ochre also in abundance.

Beside these two principal kinds used by the painters, of each of which there are several sub-divisions; there are two others, a yellow and red, used by glovers, and not so well known as they deserve: there are also a purple and an ash-colour'd kind; and to these four I may reasonably add a fifth, which is of a dusky straw colour, and serves for the rubbing upon leather breeches, and buff-belts.

It

It is not to be imagin'd, that every coloured earth is an ochre : ochre is an earth of a distinct kind from all others. As clay differs from chalk, and as might be instanced of many others ; so ochre differs in its very nature from any other kind that can be named. There are indeed clayey ochres, but they are the least valuable kinds. Ochre in its right condition, is light, brittle, dusty, and fine ; such are all those I have here named.

Yellow ochre, which is the most universal commodity, is dug principally on Shotover hills near Oxford : all England, and all Europe is in a manner supplied from this spot. The owner of a piece of land where ochre shall be found, needs not for this neglect digging it. For tho' people are principally supplied from Oxfordshire with it ; a great deal is sent to London from other places ; and wherever it shall be found, a market may be had for it.

The Dutch have ochre from Oxfordshire, which they partly use for their own purposes, and partly send over to us again after they have manag'd it different ways, under the name of foreign.

Yellow ochre lies under beds of clay and sand : but it discovers itself by lumps lodged here and there among them. When such lumps are found among clay or sand, it is worth while to be at some pains to see farther.

Yellow ochre is divided into two kinds ; one called stone ochre, and the other clay ochre ; one is ready for use as it is dug, being naturally pure and fine ; the other is foul and irregularly colour'd ; they soak this in water to get out the sand, and then beat it up into cakes.

In many places yellow ochre is found in little lumps among gravel. They pick such up in Bedfordshire, and the glovers use it.

In Northamptonshire they have the grey ochre ; the purple is not so common, but they find it in the first mention'd county. In a pit at Thingdon, there is a thin stratum of it. 'Tis used by the glovers, and sells at a small price : but it is worth the notice of painters, for it is a beautiful colour, not unlike what is called Persian red.

'Tis easy to make a guess where ochre lies ; by these tokens near the surface ; and 'tis often worth the pursuing, but it is little known. I have seen a bed of yellow ochre cut through in digging for water ; and neither the farmer nor landlord have known, that it was of any the least value.

After ochre we are to name what is called redden. This
is

is not properly of the ochre kind, but a marle of a deep and strong red ; it is vulgarly called an ochre, and by some red ochre.

The finest reddle is dug in Derbyshire, from whence it is sent to London, and other parts of the kingdom, where so large a quantity of it is used, that though it sells at a small price, the value is upon the whole very considerable.

Beside the use in marking of sheep, this earth is put to many others among the colourmen, being the foundation of a great many of those compositions that serve for large work.

C H A P. VIII.

Of peat.

PEAT, or turf, is sufficiently known by sight in places where it is burnt ; but I have found many even in those places strangely ignorant of its nature : and those in remote counties are very little acquainted with it more than by name.

It is not a wonder those who never saw peat except in the dry state, should be ignorant of its origin. It then is of considerable hardness, but the most solid peat cuts easily with a spade in the bed, being soft and tender there, though it get firmness in drying.

Peat earth consists of a bituminous matter, full of various parts of plants. For this reason when cut up and dry'd, it burns freely.

Peat is of two kinds. One is taken from the tops, sides, or bottoms of hills ; the other is dug up in a level country. The peat of Lancashire is of the first kind ; and that of the fens is of the other. They differ in colour. That of the hilly countries being pale ; and also in consistence, as it is somewhat softer. The peat of the fens is compact, and of a deep blackish brown.

These are but trivial differences, and in all other respects they are alike. The bituminous matter is the same in both, and the parts and remains of plants are of the same kind, and preserved in a like manner.

It is of consequence to the owner of land, to know whether peat may be cut in it. This, as it lies so near the surface, and as the soil discovers it, is not so often over-look'd as the rest of those valuable earths that are hidden at greater depths ;

depths; yet I have seen where a great deal has been lost by not attending to these obvious notices.

Those who live in places where peat is likely to be found, should acquaint themselves with its nature, with the marks of the soil that contains it; and with its value: That they may judge where it is lodged, and whether worth taking up.

Fen lands are the places where peat is most frequently found, yet it is not universally laid under all fenny soils. The isle of Ely, Lincolnshire, and Northamptonshire, afford it in great plenty and perfection. Other parts of fens have none. Frequently the farmer lights on it in digging his ditches, which are the common fence in that country: and the peat well pays the labour of digging.

The right peat earth is a light, spongy, tough substance; of a blackish, or of a darker, or lighter brown colour, full of fibrous roots of plants, together with flaggy leaves, and hollow stalks like reeds; and it has often many other parts of plants in it.

It lies at small depths in the earth, but never on the surface, as some from the name turf have been idly led to imagine.

It never lies immediately under the turf or sward, but always has some depth of the soil between. This soil is commonly the black moory land, or pure mould of the fens; and this is so unlike in its nature to the peat itself, that if it be taken up with it, as is sometimes done in the cutting; it always falls off with drying.

Good peat earth, as it lies in the ground, cuts soft and easy, so that they form it into shape as they dig it. When dry'd, the peats are tough and firm, they are not easily broken, and the bituminous part between the stalks and leafy remains of plants is very hard: where it is broken, looks smooth and glossy like pitch.

The blacker the peat is, the better it is: for that reason the peat of the fen lands is preferred to that of hilly countries. When it is of a pale brown, or reddish and soft, it does not burn so well. Sometimes there is clay or other earth among it, and then it is of little value.

It is used as the common firing in fen countries, and burns agreeably enough: it has some smell; but that is accounted wholesome.

Peat is of a contrary nature to manure. When the surface is laid bare, nothing grows on it, except sometimes a few rushes; and when the soil that lies over it is plowed, the farmers take care never to cut upon the peat if it lie shallow;
for

for they affirm from experience, that its mixture with the soil renders it barren.

A soft spongy soil, shaking as it is trod, with a good black mould under the turf, is the mark of peat earth underneath. It is not always found in such lands, but that is its usual situation.

It is found from one foot to four or five under the surface, and often the bed of it is of considerable thickness. It retains wet a long time, and therefore is easy to cut in the bed ; for when dry it becomes hard and stubborn, as before observed.

The best season for cutting it is April and May : the peat must be cut larger than they are expected to be when dry, for they shrink one fourth in drying.

The usual situation of peat is this ; first there is a heavy thick sod, that gives way under the feet ; then a moist, black, moory soil, of a foot or more in depth ; then comes the peat, which is two, three, or more feet thick ; and under this is a bed of clay.

This is the reason peat keeps so moist in the pit. The black light soil lets wet easily through ; and it penetrates the peat, but the clay at bottom stops it, so that it swells, grows spongy, and lifts up the soil, making it shake and give way on treading.

The grass upon peat moors is coarse and harsh ; and where the bed is thickest, the grass is always worst. Where the bed of peat is very thick, as it will be in some places five foot or more, they don't cut the whole, but only the upper part ; two or three feet at farthest into peat. The under part is in these thick beds too moist for use.

In some places there is a bed of sand instead of clay under the peat ; but this is not so common, nor is the peat usually so good.

In the fens they have two other sorts of fuel of the peat kind, but inferior in value ; the one they call fess, and the other hods.

The fess is cut from the upper part of the beds of peat. It consists of a light brittle earth, with little of the black bitumen in it, but with the parts of plants in the same manner as the other. The hods are cut out of the lowest part of the peat bed ; but it is not every peat bed that affords these two kinds. The fess only lies on the drier moors ; and the hods, which stink in burning, come from the moist bottoms of thick beds.

This

This bed of mix'd matter, partly bituminous, and partly vegetable, which forms the peat, has been supposed owing to the sediments of great floods, which have remain'd a long time upon the low lands ; but that is not the case. Bituminous matter does not settle from floods : beside the same matter is found in the same form impacted with roots, and making regular beds of peat earth at the tops of hills, and on their sides ; and these are places that can never have been overflow'd.

From this I mean to encourage the farmer, not to suppose peat is to be found only in one situation. Wherever he finds a piece of ground that shakes under his feet, and is covered with coarse grass, and that has a black mould under the sward, let him dig a foot or two, and see whether he do not find peat earth at that depth.

It is a good fuel wherever it can be had, it heats ovens better than any other : it is cheaper than any, and its ashes are valuable as manure ; though in its natural state it is of all things the most an enemy to fertility.

One singular use of peat is the keeping on fire a great while ; a piece of it lighted at one end, and dipped in water at the other, will keep light all day.

It is excellent for the nicer chymical operations, and if it were to be had universally, would be called for more than is imagined. He who can dig it, should not be negligent because it is not us'd about the place. Let him dig and dry it, and he will soon find buyers.

Other places beside hills and fens afford peat. I have seen it cut through in many meadows, when they were only digging the trenches to drain them ; and no-body regarded it. At Mears Ashby in Northamptonshire, and at Grafton Underwood in the same county, they dig excellent peat, though quite out of the fens, and far enough from the hills : it lies at about fifteen inches under the sward, with a rich black mould between ; and runs to a great depth. The mark of its being in these pastures, is a little unfirmness of the ground, and this may lead the owner of land to seek for it in many places, where the situation might not naturally make it expected.

But let the undertaker take care he do not employ his labour upon a wrong sort. Thomas Renolls, my neighbour, some years ago, cut the upper turf of a boggy ground into long square pieces like peat, and dry'd them for burning. He told me, when I represented the folly of this project, that

a

a relation of his had done the same successfully.

Whether his relation told him what was false, or he did not understand him, I cannot say, but the event was what might be expected: the turf was light and fuzzy, and did not burn well, nor was worth any thing. It was much like the sels already described, only worse. Boggy places are cover'd with a turf that is full of roots, but there is none of the bituminous matter. So that this is not peat. Neither was there upon trial found any peat earth at the bottom of this bog.

It is proper we here warn the person who shall find peat on his land of another error. It is commonly supposed the peat earth grows: but this is a mistake. When he has once cut up the quantity any place yields, he must not expect any more for ever.

In Lincolnshire where they dig great quantities, when they have cleared one dike, as they call it, they open another: and they throw into the first the turf and mould out of the new one. It is pretended this will yield more peat in twenty years, but I have seen it try'd after twenty five nay thirty years, according to good authority, and without the least success.

The drying of peat is a thing of no great difficulty. They are cut in the first summer months in the shape of large bricks, and are laid singly upon the earth to dry. They are very soft when first dug, but they soon lose part of their moisture, and harden in proportion. They are to be turn'd twice or three times while they lie single, and after they have thus got a tolerable first drying, they are to be piled up in heaps like a wheelwright's felleys, with spaces for the air to blow in between: in this manner they get thoroughly dry, and are fitted for the fire.

The husbandman must keep in mind the difference between peat, and the common turf of the ground, not only for fuel, but as used for manure: for as the peat is much superior to any kind of upper turf for firing, so on the other hand, the ashes of the upper turf of moory ground are better for manure than those of peat.

A
COMPLEAT BODY
OF
HUSBANDRY.

BOOK II.
Of MANURES. In TWO PARTS.

I. Of NATURAL MANURES.

CHAP.

1. *Of the Nature of Marle.*
2. *Of the several Kinds of pure, or unmixed Marles.*
3. *Of the several Kinds of impure or mixed Marles.*
4. *Of certain Marles found in particular Counties.*
5. *Of seeking for Marle.*
6. *Of suiting the Marle to the Land.*
7. *Of the Manner of using Marle.*
8. *Of the vast Fertility of marled Lands.*
9. *Of the Use of Mud as a Manure.*
10. *Of the Use of Clay as a Manure.*
11. *Of the Use of Loam as a Manure.*
12. *Of the Use of Sand as a Manure.*
13. *Of the Use of Gravel as a Manure.*
14. *Of the Use of Stone as a Manure.*
15. *Of the Use of Chalk as a Manure.*
16. *Of the Use of Salt as a Manure.*
17. *Of the Use of Sea Weeds as a Manure.*
18. *Of the Use of Sea Shells, and their Spawn, as Manure.*
19. *Of Parts of Trees and Plants, used as Manure.*
20. *Of Parts of Animals, used as Manure.*
21. *Of Dung in general as Manure.*
22. *Of Horse Dung in general.*
23. *Of Horse Dung used singly or alone.*
24. *Of Horse Dung made into compost.*
25. *Of the laying on of Dung.*
26. *Of the Virtue and Quantity of Horse Dung.*
27. *Of Cow Dung.*
28. *Of Sheeps Dung.*

29. *Of*

CHAP. I.

29. *Of Hogs Dung.*
30. *Of Pigeons Dung.*
31. *Of the Dung of Poultry.*
32. *Of human Excrement.*
33. *Of Urine.*
34. *Of Rags.*

II. *Of ARTIFICIAL MANURES.*

35. *Of Lime; its Materials, and Manner of burning it.*
36. *Of the Manner of using Lime as a Manure.*
37. *Of Soot.*
38. *Of Ashes.*
39. *Of Burnbaiting.*
40. *Of the several Kinds of Bastard Burnbaiting.*

THE INTRODUCTION.

Of Manures in general.

AFTER a thorough consideration of the soil, with respect to its cultivation and other uses; we are to lead the farmer to the understanding of manures; by which the improvements of cultivation are in a great measure brought about. The breaking the land by the plow, and the altering and enriching it by these dressings, are the two articles on which all amendment of a soil depends.

In the succeeding book we shall treat of manures; and care shall be taken to draw together the whole number of these; to arrange them naturally, and present them one by one before the eye of him who is to use them.

Nor shall we inform him alone of the effect each has upon that kind of land to which it is suited; but he shall know how it acts: applying his judgment, instead of trusting all to his memory.

This is our design; we are sensible the undertaking is large, as well as difficult; but we have been favoured with so many communications upon the subject, that we hope in some degree, to proportion the execution to the purpose.

In treating of manures, some things must be call'd up again which have been nam'd already; but we hope the caution that has been used in methodizing the papers, will prevent needless repetitions.

We shall first make a general division of the whole

into the natural and artificial manures: the use now made of some of the natural kinds would have appear'd as strange to an earlier practitioner in husbandry, as the invention of many of the others.

In treating of their uses and proper application, we shall build all upon experience. If the farmer were not perfectly instructed as to the kinds of lands which demand particular dressings, it would have been better for him if those manures had never been invented.

A soil may be render'd worse by bad management; as certainly as improved by good: but as we shall insert nothing here but what is supported by repeated experience, we wish the farmer to prove so much his own friend, as to give what may appear new to him, if it suit his purpose, a fair trial.

BOOK II. PART I.

Of NATURAL MANURES:

CHAP. I.

Of the nature of marle.

THE most considerable of natural manures is marle, It is in all respects superior to the generality of the others: it suits different kinds of lands; and its effects in rendering them fruitful are lasting.

Marle is a treasure wheresoever it is found; and there is no country in the world where there is more of it than in England: yet there are few places in which it is known to lie. The industry of those who deal in husbandry has not been in any thing so slack, as in the searching after this valuable commodity.

We shall awaken them to a sense of their interest, by shewing its value; and to assist them in the search after it we shall endeavour to make it known to them by sight and feeling in its several appearances; for these differ greatly. After this, to prevent mistakes in the application, the several kinds of marle shall be distinguish'd, and the particular sort of land shewn, to which each properly belongs.

Looking into what has been formerly known concerning the marles, one is concerned to see that husbandry has declined

clined in this material respect. Our ancestors two thousand years ago were well acquainted with marle and its use. The old latin writers celebrate the marles of England, and tell us that the lands were greatly enriched by them. They enumerate several kinds: and seem much better acquainted with their nature and qualities, than the generality of our present farmers.

We see what treasures marle pits at this time prove where they are open'd, and what advantage the land has from that dressing. Let us endeavour to find them in more places, and make the benefit universal.

In order to the husbandman's finding marles, he must first have a due knowledge of them. The finest kinds have often been thrown up accidentally in digging, and no one has known them. The fields have languished for want of what they contain'd in their own bowels, through the ignorance of their owner.

Marle is of several kinds, and differs greatly in appearance; but to him who will carry a general knowledge of it in his mind, it may be known in whatever form.

Marle may be pure or foul: for those beds of matter which lie in the earth are subject to mixtures as well as those on the surface, tho' not so frequently; but the deeper marle lies, usually the purer it is.

We shall first divide the marles into two kinds, the pure and the mixt. The pure marles all agree in their texture; their difference being only in the degree of hardness, and in the colour.

Pure marle is not unlike fullers earth. It is soft and fatty to the touch; it is not tough like clay, nor dusty like ochre, nor sandy like loam, but of a tender fine nature.

When a farmer finds a piece of earth of this kind, whether it be thrown up in digging a well, or by whatever other accident, let its colour be what it will, he may depend upon it 'tis a marle. In order to be more confirm'd, let him throw a piece of it into a basin of water: he will find it swell like fullers earth, and crumble in the same manner of itself to pieces. This is a confirmation. The harder kinds break slower, the soft ones quicker: some almost immediately. But in whatever manner it happens, this, joined to the others, is a sure proof that the earth is a marle. Let him who has fallen by chance upon a piece of it, dig in search of the treasure.

CHAP. II.

Of the several kinds of pure or unmixed marles.

OF pure marles there are four principal kinds, distinguished according to their colours.

A white,

A red,

A yellow,

A blue;

there is also a black, but less common.

These are distinguished under the name of pure marles of those colours; for there are also of the foul and coarser kinds of the same.

These excellent marles are more common than is supposed. We have seen the blue marle thrown up in Buckinghamshire, and the red in abundance in Warwickshire, as fine as the best in Sussex and Kent. And not many years since in Worcestershire, as much white marle was discovered among the rubbish where they had been sinking after salt springs, as returned a great part of the expence of digging.

Though there are but a few counties marle is in use, I believe there are very few where it may not be discovered; nor is any thing more worth the search.

Marles of these several colours, vary in their texture and hardness; but, in general, the white are the softest and lightest, and the blue are the firmest and heaviest.

For this reason the white is most used for pasture grounds, and the blue for corn lands. This is the general practice in Kent and Sussex, where marles are most frequent, and their use is best understood: the white being there almost universally of a loose crumbly texture, and the blue of a more compact and firm substance.

But this is not to be established into a law to the farmer. Though in those counties where they have choice, they use the softest for pastures, because they dissolve most freely; and the harder for plowed lands, where they are more assisted by tillage. He who has either kind, may use it indifferently on both occasions, in this manner.

If it be the blue, or any other of the compact sorts, let him lay it upon his corn land, early in the season, that the weather may mellow it before the last plowing: if it be for pasture ground, let him in the same manner lay it on in time, spreading it thin. If it be the white, or any other

other of the loose and crumbly kinds, it need not be laid on till late, because it breaks and dissolves almost as soon as exposed to the weather.

The colour of marle is no certain proof of its nature; but, in general, the red and yellow are of a middle degree between the blue and the white.

At Blunds-Court, and in the parish of Shiplake in Oxfordshire, there is a whitish marle, of the crumbly kind. It is used both on corn lands and pasture grounds with great success. They lay it on at any time of the year, for it melts into the earth like cream, almost as soon as it is spread.

In Warwickshire there is a blue marle, the same that is so much esteemed in Suffex. This is at first as firm as clay. It should be laid on corn lands at the beginning of winter, that it may be broke by the frosts and rains.

It is plain that the use of marle was known in this country in the time of the Romans. There is also proof that it has been used long since that period in many places, where the farmers know nothing of it now. A melancholy proof that the art of husbandry has declined in the late ages.

There is a common report among the people of Northamptonshire, that marle was long used there: in Crickfield in that county, there are a great many old hollows, which they at this time call marle pits or marlow pits, and which were dug for marle.

In the lordship of Winwick, in the same county, are many other such holes, all which the country people have heard their fathers say, were dug for marle to improve the land: and the old deeds of estates mention marlaria, or marle pits, as articles of value upon them.

In the same manner in almost all the counties in England, there are one where or other in the fields these old delves, pits or hollows: they are now overgrown with grass; but in those counties where marle is commonly used, they are generally known to be old marle pits; and in others they have usually some report of their having been dug for something to manure the land.

For no manure whatsoever is so advantageous. Let the farmer consider well the nature of his marle, and the nature of his soil, to see they are suited to one another; and if his first trial do not succeed, let him not be disheartened, but go on; he will not fail of success afterwards.

They use marles in some parts of Buckinghamshire as frequently as dung in others; and yet in other parts of the same county the farmers seem not to know there is any such substance in nature. I was the occasion of a farmer's trying a red marle, found there very near the surface of the earth, in digging a ditch for a fence. It was one of the pure kinds, and as soft as fullers earth, it crumbled in the same manner in water, and crackled on being put in the fire. I shewed him by these and other marks, that it was a right marle; but whether he laid it on a wrong soil, or in whatever unskilful manner he managed it, when I next saw him, he reproached me for advising him to use it, and declared he would never try projects again. So difficult is it often to get these people to make any attempt; so next to impossible to make them persevere.

C H A P. III.

Of the several kinds of impure or mixed marles.

THOSE we have named are the richest and finest of the marles: as all mixture debases their value, among the other kinds, the most impure are of least value. These mixed marles differ in colour, and in their nature, according to the substances which have got in among them. The colour of these is no general mark of distinction, but they may be arranged under separate heads, according to the substances of which they partake. These are sand, clay, loam, or stone, and they may be marles considered as

sandy marles,	loamy marles, and
clayey marles,	stony marles:

therefore among these last are also to be comprehended some which have at first the hardness of a stone from their own nature and composition, though they have not a particle of real stone in them.

Some marles beside these natural earths and stony matter, contain great quantities of sea shells. These are preserved in them in a singular manner; for instead of being petrify'd or render'd hard, they are made brittle, and seem as if they had been calcined. These shells are far from injuring the marle in its improving quality; on the contrary they are found to encrease that virtue.

There

There are marles of these kinds of all the beforementioned colours, but greyish or yellowish are the two most frequent. The sandy are the richest of these impure marles: and they are fittest for ready use; for they break to pieces in the hands easier than any others; and the soonest of any crumble with the weather. In a proper application these may be accounted of equal value with any, for on clayey lands the very sand which is contained in them is useful.

The loamy marles are the next in value, for they break easily with the weather; but in these as well as the former, a great deal of the advantage will depend upon a proper knowledge of their nature, and their use on a right soil.

The clayey and stony are inferior: but on some lands the former are preferable to those which are more pure; and amongst the stony kinds there are some, even of the hardest; which, when properly mellowed by the weather, are inferior to none in richness. I have seen some of these that a large hammer would not break when first dug up; but with frost, rain, and sunshine, they have in six months crumbled to powder.

Others I have seen which when broke with great labour, and laid upon the lands, have for several months appeared like so many stones, and seemed to damage rather than improve the spot: but after one winter there has not been a piece so big as a nutmeg to be found; and the land has been kept in heart eight or ten years by that single dressing.

A farmer in Warwickshire having a stony marle upon his ground, dug it at a large expence, while all his neighbours laugh'd at him; and after it had been exposed to the air and rain in his yard till it began to crack and break, he laid it on his corn lands, and had it broke there with hammers: after this it soon melted and enriched the land to a degree beyond belief.

They have in Northamptonshire a stony loam which the common people call penny earth; it is full of sea shells, some of which are flat, and resemble pieces of money. This is as hard as rock when first dug, but it moulders with the weather, and even the shells that are in it dissolve, so that not one of them is to be found on the lands where it has been laid. They use it in some places, but not nearly so much as it deserves. When it is kept dry, it retains its hardness for ever.

Marle in some places is to be dug at a considerable depth,
and

and even this is well worth while : but more frequently it lies near the surface ; sometimes so near, that they plow up a part of it with the mould ; and the same action turns and measures it, and that very profitably.

In Kent the marle sometimes lies deep ; but in Suffex it frequently is within a foot or two of the surface, with a tough clay over it ; this answers a very convenient purpose, for it holds the marle so well together above, that by undermining it they can have a fall of a hundred loads or more at a time, so that the expence is hardly any thing.

CHAP. IV.

Of certain marles found in particular counties.

IN Buckinghamshire I have observed a rich marle of the purer kind, of a mixed nature between the blue and red ; the red making the body of the mass, and the blue disposed in veins. This is one of the fattest kinds, and is the same that is so much esteem'd in Kent for sandy land.

In Warwickshire they have a blue and red marle of a stiff kind, which does not answer well on pasture lands, but excellently on sandy corn grounds.

In Cheshire they have a stony marle, which they call slate marle, because it splits into flat thin pieces ; they have this of all the common-colours, and it is much the same whether red, yellow, whitish, or blue.

They have also in Staffordshire on the borders of Cheshire, a stony marle, which breaks in a kind of square pieces ; this they call dice marle. It is yellowish, redish, or blueish. Both these, though stony at first, mellow, and fall to pieces with the rains ; and are greatly esteem'd. They have in the same places clayey marles, but those clog the land after their enriching effect is over ; whereas these leave it better than it was before, even after their enriching virtue is gone.

In most countries they value the stony marles, because of their lasting efficacy. The fatty and crumbly kinds enrich the ground more suddenly ; but these hard ones give that fruitfulness which lasts many years.

Some of these harder marles, which enrich land for so long a continuance, have a bad effect in the end. After this long period of fruitfulness is over, the soil becomes so barren that scarce any thing can make it fruitful again.

The

The hard white marle is most subject to this censure, for it approaches to the nature of chalk, and the same thing has been observed of chalk to a proverb.

To these marles mention'd for their use in particular places, I shall add three or four others.

In Shropshire, and that part of Cheshire which borders on it, they have a dusky brownish blue marle, spotted with a cleaner blue and white: this they call cowshot marle, and the country has received great advantages from the time in which it has been introduced into use.

In Staffordshire there is a stony marle, which they call shale marle there as well as in Cheshire, where it is also found in abundance. This is greyish, and seems a mere sand stone: but it breaks freely enough. They do not use this generally, but it turns to a good account. If the farmer therefore finds a blueish grey sand stone in his grounds, let him try whether it does not moulder in the air, or crackle in the fire, and if so, let him see to make a better use of it than they do in many places in this county, where they absolutely throw it away.

In Cheshire they have a marle of a dusky colour, and tough substance, unlike the generality of the kinds; this they call peat marle. It is one of those which are debas'd by clay: they have it in Shropshire also; but the use differs. In Cheshire they use it as a manure; and if laid on proper land, as the sharp sandy soils, it yields a good encrease: in Shropshire they make bricks of it.

They have in Cheshire, Staffordshire, and some neighbouring counties, a stiffer kind than the last, of a yellowish colour, and from that and its toughness they call it clay marle. This often lies in very deep beds; it is full of sand and pebbles in the upper part, where it often rises within a foot of the surface, but it is pure below. They use this on the worst lands with very good success. Let the young husbandman therefore, who thinks his land is clayey at the bottom, in some particular spots only, examine this clay. They say all is not gold that shines. Things are often worse than they seem; but sometimes they are better.

They have also in the same county a kind of marle they call paper marle: this lies in leaves, and is a very pure and rich kind.

Cheshire is remarked for another kind of marle, by some suppos'd to be particular to that county, they call it steel marle.

This

This is of a dusky colour, often spotted with red, and sometimes with blue. It is very hard; and when struck with a hammer, naturally shatters into a kind of square pieces. It is one of the stony kinds, and is nearly the same with that which they call dice marle in Northamptonshire.

I have observ'd with pleasure, the manner in which this marle divides when laid upon the ground. At first the large lumps lie about like so much lumber: after this one sees all the surface of the field spread over with corner'd pieces of some considerable bigness: then after a little more effect of the weather, it lies every where in bits like dice, many of them very small; and after this it is blended with the mould, and altogether lost. Then it is that its full virtue is seen in the crop.

CHAP. V.

Of seeking for marle.

THE husbandman thus sees the vast value of marle: and it is natural he should seek for it on his own grounds; we shall endeavour to assist him in the search.

It is frequent in many places where it is not regarded or even known: and although so little observed, it is a commodity so naturally and generally the produce of England, that I believe there are few pieces of land of any extent in which one kind or other of it may not be found.

If it lie too deep, it may not be worth taking up, but that is seldom the case: it is commonly near the surface.

The several kinds have been here so fully described, that the farmer has reason to suppose he shall know it at sight: We shall now add the soils under which it usually lies.

He should first examine well by report and by the appearance of the ground, whether marle has heretofore been dug in his land, or any where near its borders.

If it has, let him look after those broad and shallow delves before mention'd, for they are certainly the places where the pits were. If he learn nothing by report, yet let him see if there be any such hollows in the ground, for though less certain, they are an evidence that something has been dug. It may have been gravel, but marle is more likely.

If he find such hollows, let him mind the course wherein they run, for that way probably the marle runs also.

If he find only one, let him observe how deep it is; for
on

on this depends the nature of his search, by this he may guess whether the marle lay low or near the surface.

His business is to try all about the place. If the hollow be very shallow, let him have holes dug to the depth of three foot with a spade; if deeper, let him use an augur, such as they bore the ground with. Let him bore in many places to the depth of six foot: if the marle lie deeper than that, 'tis hardly worth digging; but let him examine strictly every thing the augur brings up within this compass. Let him keep in mind the various kinds of marle; and if any thing come up that has the least appearance of them, let him try it by seeing if it moulders away in water, if it crackles in the fire; and what effect the sun and air take upon it when it has lain two or three nights expos'd.

Thus if there ever have been marle dug there; and the vein of it continues, he will find where it runs; and he is then to follow the course of it by the augur, and consider where he can open a pit the most conveniently for the general use of his land.

But if there be not the least sign upon the ground, or least account that marle ever was dug thereabouts: this should not discourage him from enquiring; for there is a time for the discovery of every thing.

In this case he must have recourse to what he sees upon digging. If a well be sunk at any time upon or near his land, let him look carefully over all the kinds of earth that are thrown up. Nay, when a pond is dug, let him make the same observations.

Let him examine the sides of ditches new dug or cleaned; and follow the plow with a careful eye, observing if it any where turn up matter different from the soil.

If he discover nothing in these researches, let him then try the augur, boring in different places.

Clay oftenest lies under marle: mellow earth is the next soil that is likely to conceal it: and after this the loamy earth. It sometimes lies under gravel, but seldom in plenty: it rarely is found under a sandy soil, and then commonly in a thin vein, and at a great depth.

The clayey soil oftenest has marle under it; and it is usually of the finest kind. The Kentish marles generally are cover'd with a foot or two of tough clay.

The black mellow earth of the low lands, often has under it a bed of tough clay. Sometimes it has a thick bed of some fine marle in the place of the clay; and very often a vein

vein of marle comes between the clay and the mould.

The former is the best, but if the latter presents itself, let him follow with his augur the course of the vein, and he will find it gradually thicken till at last it usually takes the place of the clay. It is here he is to open his pit; and he will probably fall upon a bed of marle five, six, or seven foot thick, rising within a foot and half of the surface of the ground.

The stony marles are sometimes found under clay or black mould, but it is more commonly the pure, fatty, and tender sort: as to those under sandy soils, they are usually one or other of the clayey marles.

In some parts of Suffex a bed of marle comes up within eight inches of the surface, and is ten or twelve foot thick, all of some pure fine kind. In Cheshire and Lancashire, where the best marles often lie under the fine black mould, I have seen a bed of blue marle that was within a yard of the turf, cut down to four yards deep, and they were not then got through the vein.

When the farmer has found a vein of marle, and fix'd upon a good part for opening of a pit: let him begin by marking out a large extent for the work, and for a proper way for the carts.

His labourers are then to clear away with pick-axe, spade, and wheel-barrow, all the soil that covers the vein; and then they are to begin digging it.

Where it is of the finest and tenderest kinds, they work with a kind of hoe, and three hoers will tear up as much as four men can fill it into the carts.

In the clayey marles they use spades for digging, and the diggers must be more than the fillers. Sometimes these are so dry and tough, that the workmen must have water brought to them to wet their spades: and in other places they are so wet, that there must be a pump to keep them dry.

The marle is to be shot upon the fields; but in a different manner according to its nature. If it be of the fine soft tender kinds; the best way is to spread it as it is taken out of the cart: but if it be of the stony or other compact sorts, every load had better be shot separately, and left in a flat heap for the winter, that the frost and air may mellow and break it.

CHAP. VI.

Of suiting the marle to the land.

THERE are few lands that may not be improv'd by marle, but some require it more than others. There are also many kinds of marle, as well as soils; and those of one kind are fit for certain lands, those of other kinds for others.

In some places they lay on such a quantity of the marle, that they may be said to add a soil rather than to improve what was there. This is the practice in some parts of Cheshire; they will thus in digging and carriage bestow twelve or fifteen pounds upon marling one acre; but then they will work it with good management twenty or thirty years together.

In this case they plow shallow the first year; they don't cut up more than an inch of the soil, going deeper afterwards.

The soil which requires marle most of all, and which is the most improv'd by it, is the sandy.

The marle fit for this land is the clayey kind, and particularly that brownish or yellowish marle, which looks like red clay in the pit. This, or any of the clayey kind, laid thick upon a sandy soil, gives it at once a body and a richness. The clay that is in it binding the light soil tolerably together, at the same time that the fatty and enriching earth blends itself with the whole.

By this means land, that before would yield scarce any thing, has been known to produce great crops: it has been try'd by way of experiment, to marle one half of a piece of new broke-up ground of this sandy kind, and leave the other in its natural condition; then both being sown with the same seed, the marled part has yielded a plentiful crop, when the other has not ripen'd one ear.

In years wherein other crops fail, those succeeds which are on these grounds even to admiration. If there comes a dropping summer, while a piece of marled sandy soil is in its full vigour, the increase is prodigious. These seasons hurt the crops on other lands; but they load these with as much as can stand upon the ground.

All this time the marle must be suited to the soil by this rule; the more sandy the ground is, the more clayey the marle must be.

If

If a rash husbandman hearing of the profit that arises from laying marle on sandy soils, should without farther thought lay on one of the pure fat and tender kinds before described upon a barren sandy piece of ground, tho' he put on a Cheshire loading, the wet would wash it in, and the sand would swallow it up in such a manner, that the whole effect would be lost at once.

Next after the sandy, the soil which receives most advantage from marle is the loamy: this admits the greatest improvement of all when the sand in its composition bears an over proportion to the clay. I have seen lands, the soil of which was fitter to make bricks than to yield corn, so improved by marle, that the corn has stood like a sward of grass at its first appearance; and has throve so afterwards, that every stalk has come to a due maturity.

The marle for this land must be the purest and finest that can be had. If the farmer lay on a clayey, or a sandy marle, he would only encrease the proportion of one or other ingredient of the land which already made it barren.

What renders a loamy earth fruitful in its natural state, is the quantity of mould mixed in it: a fine marle is of the nature of that mould, only richer: it blends among the loam, and the firmness of the loamy soil holds it till it has yielded all its virtue.

Of all the marles, that which agrees best with a loamy soil, is the blue, pure and tender kind. After this the best is the yellow: but any marle that is light, fine, and free from mixture will answer the purpose.

The stony marles have been tried in some counties upon loamy soils with tolerable success. In Staffordshire that sort they call shale marle is often laid on a tough loamy soil.

This has succeeded poorly at first. The second year somewhat better, and the third and fourth best of all. But the pure marle is preferable. The farmer may use any of the stony kinds when he cannot get the others, and he will reap advantage from it; but when he has choice, the pure kind is preferable by many degrees.

I have seen some stony marles, not of the hardest kind, used on sandy soils, but without any success. I once indeed saw a stony marle that had lain a season exposed to the air, spread upon a field; the soil of which tho' sandy, had some natural richness, and it succeeded tolerably; but such particular practices are not to be established into rules.

The marling lands is founded upon reason; and that, as well

well as experience, will shew in what manner it must be done. The pure marles are all fatty; the mixed kinds are either clayey, sandy, loamy, or stony: now upon considering of this the application is easy.

Let us suppose a considerable farmer to have pits of all these kinds; and to have a sandy soil to improve: he will ask himself which of all these I shall use? If I lay on pure marle, the rain will wash it to pieces, and the sand will suck it up and remain as barren as ever. I may lay that upon soils in which there is something to hold it, but never upon sand: all the pure kinds therefore are unfit. Shall I lay on a sandy marle? No: for the sand will mix with the sand, and the marle will be washed away as before. Shall I lay on stony marle? No: 'Stone and sand are but a poor mixture, and when it breaks, it will wash away as the other. Shall I use a loamy marle? The clay that is in loam will do some good, because it will hold the fatness; but then the sand in it is again adding sand to sand: there remains the clayey marle, and this is fittest of all, because the clay will bind the sand, while the marly part enriches the soil.

Thus reason would advise, and experience shews it is the most profitable practice.

After sandy and loamy soils, that which receives most advantage from marle, is mellow earth: this wants improvement less than any other kind, but the proper use of marle adds greatly to its fertility. There is this farther advantage, any kind may be used to it: but still there are some from which it has more benefit than others.

Plowed land, meadow, and pasture, with this soil, equally receive good from marle; only the pure marles should be used to grass lands, because they wash in readily, and don't lie about in lumps upon the ground. For plowed lands of this soil, any kind may be used. If they be of the clayey sort, they break in with plowing; if loamy, they blend the sooner; if they be stony, it takes time for the weather to divide them, but they do very well at last: finally, if they be of the pure or of the sandy kind, they break with the first dressing, and wash in immediately.

All the farmer has to regard is, whether the mellow soil approach to the nature of any of the others; and if so, he is to suit his marle to the nature of the soil whereof it most partakes.

Marle is not most suited to chalky soils, because it is itself

in some degree of a chalky nature : nevertheless it is to be used with prudence to good purpose.

The brittle white marle is often so like chalk, that I would by no means advise using it on chalky lands, though on others it may serve as a manure in the manner of a fat chalk, which is known to be an excellent one itself. The difference between chalk, and this chalky marle, is, that the effect of the marle is more speedy ; and that it does not wear out the land so much as chalk does, which in the end leaves it, unless very well manured, more barren than at first.

Though it be not advisable to lay the white marle on a chalky soil, I have seen the rich and pure red, and in some other places the blue, used with great profit. Nor is this contrary to reason : chalk is one of the driest of soils, and these marles are the fattest of all manures.

The blue and red pure marles are best for these soils ; after these the pure yellow marle, or the black. And in defect of all these, the loamy, or the clayey marles.

Gravelly soils have the same advantage from marle as sandy, as they always have sand among the gravel. These let other manures be washed through them by rains, but marles of a proper kind remain in them. They not only enrich by their own mellowness, but they give the land a firmness that will make it hold other dressings. Dung laid on a gravelly soil is swallowed up without any benefit, but dung upon such a land dressed with marle, takes the same effect as on other soils.

Great care must be taken in this case to suit the marle to the soil ; if a pure marle were used, it would be washed through quicker than dung ; and if a sandy marle were chosen, the marley part would go down, and only the sand remain. This would impoverish a soil already too sandy.

The proper marle is the clayey ; and this never fails of giving great advantage.

Clayey soils are supposed to be improper for marling. Every common farmer can repeat what is retailed through all the common writers on husbandry,

He that marles clay,

Throws all away.

And this he has two reasons for believing to be true, because it is verse ; and because it is in print. But let not the reasonable man be frightened out of his profits by rhymes. Reason is on the contrary side, and reason is supported by experience, in this as in all other things.

It

It is easy to throw away cost and labour by laying an improper marle upon a clayey ground ; and the same may be as truly said of any other. But when the suiting the marle to the land is observ'd, the same benefit will follow from the use of it on these, as on other soils. All soils are capable of improvement by marle, because there are marles of different kinds, some of which are suited to every soil. He that should lay a clayey marle upon a clayey soil, would have little advantage : perhaps the farmers who first try'd to marle clayey grounds, had no other than such marles ; and thinking all others like them, they spoke that in general which was only true in particular.

Excepting the clayey marles, there is no kind but what is good on clay grounds. The pure marles being well worked in by the plow, blend with the soil, and loosen and enrich it. The stony kinds lie on or near the surface till they break. The loamy marles, if there be too much clay in them, are to be rejected as approaching to the nature of the clayey kind, but if otherwise, they are excellent. The sandy marles are for clayey soils the best of all : they consist only of a fine fatty marle and sand, and they act doubly upon the clay, at once loosening and enriching it. As soon as they are laid on, they crumble to pieces ; and thus the sand gets into the clay, and makes way for the marle, which the rains wash thoroughly in, and which is then detain'd among it to exert the full effect of its fertility.

He that has a clayey soil to manure, and can get at a sandy marle, has it in his power to raise his land to many times its original value. If a due quantity be laid on, the sand converts the clay into a loam ; and it becomes as it were another soil, enriched with a mellow and fine manure.

C H A P. VII.

Of the manner of using marle.

THE manner of using marle is no little article in its success ; and in this the experience of others only can be our guide, comparing their success one with another : for not only the practice of a particular county may many times mislead the farmer ; but what has been written under the appearance of advice is often false.

As to the quantity that he shall lay upon his land, the truth seems hard to find. Some of the Staffordshire farmers

lay on so little, that it scarce answers any purpose: perhaps twenty loads to an acre: and then they have complained that what was written of marle was not true. In Cheshire, on the contrary, they bury their land under such loads, that they seem afterwards to sow their marle and not their ground.

The medium between these practices is best: and he who would reap all the advantage of marle, must follow that course. The right use is not to put it in the place of the soil, but to make a mixture of it with the soil, so as to raise a poor land into the condition of one naturally rich: to do this, a due quantity of the marle must be employed; and to give a general rule, that should be about ninety loads to an acre.

The best way of sowing marled land is under furrow.

And the farmer is not to look for the full effect the first year; the good will last according to the nature of the soil, and the kind of marle, seven, ten, twenty, or even thirty years.

When the farmer sees his land that has been marled, after fair weather look all over white, as if covered with a hoar frost, he may conclude it will answer his expectations. It is a proof the marle was good, that it has been used in due quantity, and that it is well mixed with the land.

Some speak of this white appearance as a mark that there is marle in the land where it is seen; but marle cannot discover itself in that manner in its natural beds, unless they lie almost close to the surface. It is therefore of little use in that respect; but on the lands where marle has been laid, when there is this appearance, 'tis certain that it is mixed and mellowed in the ground.

If the stony marles are used, they must be laid on early in the season: if the clayey, a little later; the loamy may be later yet than the clay: the pure marles of all kinds, and the sandy marles, are to be laid on latest of all. The proper timing of this dressing, regards its effect for the ensuing year; but the harder kinds with the best management will not do much so soon.

The method of piling the stony kinds in flat heaps, that they may break before they are spread on the land, is useful. Some sprinkle the marle, in heaps, with water, to assist this breaking: and in some counties they calcine not only these harder marles, but any kind they have into lime, in kilns made for that purpose. They all burn easily, but they make a weak kind of lime. I have seen this tried with great advantage

vantage on some very indifferent lands: the quantity to be used of the burnt marle is about fifty load to an acre.

This burning of marles, though it succeed well enough, is altering their quality. It is fittest for the harder kinds, but the use of the natural marle is far before it.

The best method of laying on the marle is, to shoot the loads as they are brought out of the pit, at equal distances; and then to spread them all. This will occasion the ground to be all covered with the same thickness. When it is thus spread, it must be well mixed with the soil, and all laid smooth and level together. The quicker this is done from the time the marle be taken out of the bed, if it be a pure or a sandy marle, the better; for as these crumble to pieces almost directly, the business is to get them mixed in the ground at once, that they may begin to break among it, and soon make one body of the whole; for this is the true nature of an improvement by marle.

A clayey marle should not be laid on in the beginning of winter, for it sometimes, instead of breaking, grows tough with the repeated wet, and the land that should have been improved, is rendered worse by it.

This has made the farmers in some places declare against marle when they had tried it. Accidents are possible to all things, they usually happen through ignorance; but sometimes the seasons occasion them, and the prudent farmer is to inform himself how they may be cured.

In case of binding in this manner, he must strew over a small quantity of marle lime, or of other lime mixed with well rotted dung; this will immediately break the marle: and the land will be so much the more enriched by this double dressing, that the largeness of the crop will leave him no room to complain of his double expence: it will be doubled in proportion.

If the field lie level, the marle should be spread evenly over it: but if it lie upon the descent, the best way is to spread the marle half as thick again on the higher part of the field as on the lower, for the rains will wash enough of its best part down to make all equal. I have seen where a field has lain greatly on the descent, and this management has not been used, the crop vastly thicker on the lower part than on the upper; and on examining the soil, it has appeared quite different; not only a great deal of the richness of the marle, but of the finest part of the mould itself being washed down.

These are accidents on which the prudent farmer should always have an eye ; for he may prevent their inconveniences by right management.

Burnt marle, or marle lime, can never be needful where pure marle has been used, although it may after the tough clayey or other mixed kinds ; for instead of binding, the pure kinds moulder away either while they are wet, or in the drying.

The soil is also to be consider'd for the time of laying on the marle. If it be a hard binding ground, the best time is the beginning of winter ; if a light loose soil, the spring or summer : always accommodating this also to the nature of the marle.

If the farmer determine after eight or ten crops to have grass, he must manage according to the nature of the marle he has used.

If it were a stony or a sandy kind, or any of the purer marles, when he lays the land for grass, it will come with great strength and freshness : but if it were a clayey marle he used, so much of its binding quality will remain, that he must give it a dressing of dung and lime toward the end ; by this means it will yield him two or three crops more, and excellent grass afterwards.

It is impossible to give one direction for all lands, as to the times of repeating the marling ; but the farmer will see by his crops when the land needs to be refreshed.

C H A P. VIII.

Of the vast fertility of marled lands.

TO encourage the farmer to this excellent part of husbandry ; we shall add the advantages ; which are so great, that he who has not lived in counties where it is used, will not easily believe them. However, having truth for our guide, we shall speak freely, and refer the cause to the determination of experienced persons.

The quantity of corn that will ripen upon a well marled land, is much greater than can have nourishment on any other, for nothing is so full of real nourishment for corn as marle.

A barren soil which would hardly afford nourishment to wild grass or weeds, being well covered with marle, has yielded prodigious crops of corn.

In

In Buckinghamshire I saw this experiment fairly tried by a gentleman who had discovered a good, fat, but somewhat clayey marle upon his estate : he ordered an acre of barren land, that in the memory of man had hardly let for any thing, to be covered with a vast quantity of the marle. The eyes of the farmers were upon him, and the first year they laugh'd at him as a schemer, for it did not yield much ; but the three succeeding years, though he did no more to it, the crop was larger than that on any of their best lands.

This is fact : and is not this a plain way for a farmer to make a fortune. Let him see there is marle to be had ; and then let him take a piece of such ground ; he will have it for little, and it may thus yield more than the finest lands in the country.

He who shall attempt this, need never be afraid of the expence of dressing the ground. Let him take care accordingly, that the marle he uses be a proper kind for the soil, and it will answer at any price.

The Cheshire farmers who use so vast a quantity of marle, and often fetch it a great way, never find themselves losers, except by the folly of ill-matching the soil and kind.

The advantage of marle is its lasting virtue, and according to that is to be counted the expence ; good dung is worn out in three years, and must be renewed : but the marling lasts thirty in some places. In this case, though it should cost ten times as much, the price is the same in the end : and there is no proportion between the crops on dunged land, and marled.

There are years when most other lands fail : but it is the advantage of marle that it stands all seasons. This enriches the farmer doubly, because of the advanced price of corn in those years ; and at the same time it is a benefit to the country.

To these observations we shall add a letter from a worthy and experienced gentleman in Shropshire ; containing some things, which as they came so well from his hand, we have not mentioned before.

To * * * * *

S I R,

“ Whereas I understand you have been making enquiries
“ about the nature and use of marle in this part of England,
“ designing to print your observations ; I take the liberty,
“ though a stranger to you, to contribute my mite to so good

H 4

“ a

“ a work : and you may depend all I say is true, for I have
 “ tried it. Our farmers know the use of marle well enough
 “ on their corn lands, but they don’t use it on pasture and
 “ meadow grounds so much as they might. I have for many
 “ years had better hay, and better feed for my cattle than
 “ any of my neighbours : and though I tell them it is be-
 “ cause I marle my grafs grounds, they won’t imitate me.
 “ But I assure you from experience, it is very profitable. I
 “ once damaged a fine meadow by laying on a clayey marle ;
 “ and another time I buried the grafs by loading it too
 “ much : but now I have found by frequent trials, what is
 “ the right sort and proportion, I never fail. I lay a light
 “ crumbly marle upon my grafs grounds, not minding the
 “ colour ; and I allow twenty load to an acre ; this always
 “ pays ten-fold. Another thing I must needs tell you,
 “ which I have learned from experience. When I design
 “ to break up a piece of ground, I marle it well two years
 “ before. I allow for this thirty load of good marle to an
 “ acre ; by this means my first year is as good as some
 “ people’s second or third after marling. Then there is
 “ another thing : upon my marled plow’d land, I don’t be-
 “ gin with wheat as others do : I sow for the first crop oats,
 “ the land is in heart enough to yield them well, and then
 “ the three or four next crops I have wheat or barley. I al-
 “ ways do another thing particular, that is, I harrow in the
 “ marle just before I plow it, and thus I mix my marle bet-
 “ ter with the soil than they ever can do. I have at one
 “ time or other tried the different grounds in my possession,
 “ with different quantities of marle ; some require more,
 “ some less : but upon a medium, I think between a hun-
 “ dred and a hundred and fifty load to an acre is the due pro-
 “ portion. I have one field that swallowed above two hun-
 “ dred load to the acre, but I am sensible now that was be-
 “ cause I used a wrong kind. I find by experience that my
 “ flat lands do best for marle, for it does not well lie upon
 “ the others, ’tis so easily dissolved and washed away by
 “ rains : I always allow a larger quantity to those fields, but
 “ they do not succeed so well. If these remarks can be of
 “ any use, I shall be very glad to have given any help to
 “ your publick spirited design ; who am,

Worthy SIR,

Your humble servant to command,

William Hunfdon.

CHAP.

CHAP. IX.

Of the use of mud as a manure.

FROM marle we shall proceed to examine such other manures as are of an earthy nature.

The next in order is mud; for although mud is in its origin and nature different altogether from marle, yet it more than any other kind resembles it in some of its effects.

Mud is mellow earth, washed and worn to a surprizing fineness by the action of water. This is the condition of pure mud: of the other kinds I shall speak presently. This is such as is drag'd out of rivers, where it has been many years collecting, and where sand and all other foulnesses whatsoever are thoroughly washed from it.

'Tis this which in some of its properties resembles marle. It is the softest, fattest, and mellowest of all earthy substances next to that; and like marle it breaks with the least rains, and crumbles away: so far they are alike; as also in giving great fertility: but marle is a particular substance, and has a lasting quality of enriching land, whereas mud is only mould in a certain form, and its effect is of no long continuance.

The next to the mud of rivers is that of ponds: but this is less pure and fine: it is often clayey, and generally has some mixture of sand.

The last kind to be named is that mud which is thrown up in the cleansing of ditches. This is the poorest and worst of all: but even this is not to be rejected or despised; it has particular uses which the finest would not answer so well.

The mud of ditches, by road sides, is full of grit and sand, blown in with the dust: it is short enough, but wants mellowness.

The farmer must distinguish these three kinds of mud by the names of river mud, pond mud, and ditch mud; and then consider what soils each of them will suit.

Mud is most laid on pasture and meadow grounds. But this need not be an universal rule. Marle may be used with advantage on pasture grounds; and mud will also help many corn lands,

Marle is used alone, but mud with other ingredients: in some instances marle may be mixed also; and in several cases mud may be best used alone.

River mud is proper to give fertility, and nothing else; for
its

its richness is all its character. Pond mud will enrich, and at the same time give a body to the soil from the clay it usually contains; and ditch mud though it will less enrich, will serve better than any to break a tough land.

When mud is to be laid on a plowed land, this is usually the kind.

River mud is proper for meadows and pastures of a mellow soil, that want nothing but a recruit of that fine mould, which the several growths have wasted and drawn forth; pond mud is best where the soil is light and crumbly; and ditch mud on a clayey ground.

Mud of rivers mixes in a favourable manner with the finer part of dung. This we see in meadows. When we give them a sprinkling of mud and dung mixed together, after a few showers going over the ground, the strawy part will be found washed clean, and nothing else remaining; the mud and the rich part of the dung being wholly gone down into the land: and the next crop sufficiently shews their effects.

People talk greatly of virgin earth; that is, earth on which nothing ever grew. River mud is the nearest this of any thing whatever.

In some parts of Northamptonshire, they lay the fine black mould which they call moory soil, upon dry gravelly grounds with great success; the mud of rivers would answer this purpose better: a husbandman of that county, who used to take this black soil out of the fen lands for stony pastures; having used mud dragged out of the river Nen in its place, found he could dress his pastures at less than half the expence, and that they produced better.

The farmer who has dry pastures, whether of a stony, gravelly, or sandy nature, should use this manure preferably to all others.

If the land be of a loose nature, let him use pond mud, mixed with rich well rotted dung.

If the soil be mellow, and only require to be recruited, after several growths let him mix pure river mud with the dung of poultry or sheep, and scatter this lightly. It is best to use a little at a time, and repeat it often.

If the soil be clayey, let him take the mud of ditches, and chalk, and some rotten dung: this spread tolerably thick, will break and mellow the ground, as well as give it warmth and richness.

A farmer in Lincolnshire, where there are fine feeding grounds, always excelled the neighbourhood in this respect; and

and it was by means of a compost of his own inventing, of which he gave me the following account.

He made choice of a piece of low ground near his house, where the drainings of the yard naturally came. He there dug an hole eight foot deep, the soil was a mellow earth, and at this depth it rested upon clay; and there was some sand and gravel, and a thin bed of light clay between. He made his diggers throw up the good soil on one side of the pit, and the clay, sand, and gravel on the other.

The pit being sunk, he threw in first some litter, and upon that a layer of large hedge weeds, that were not run to seed; over these he threw in the soil that had been laid by itself; then he threw in cow dung in a good quantity. After this they drag'd up the weeds out of the nearest waters, and laid in a great bed of them; these they covered three or four foot deep with rich pond mud: upon all this they threw in more earth, from the parings of banks, and cleaning of ditches; and then laid over all, some more litter to stop the wet, and let it drain there.

This matter lay a great while rotting together, and receiving the rich drainings of the yard. When all was mellowed he dug it out, and spread it lightly upon his pasture grounds.

It is in every farmer's power to imitate this practice. It will excellently answer the intent in grass grounds; probably it would do very well upon the mellow soils in corn lands, but this has not been tried.

CHAP. X.

Of the use of clay as a manure.

IT may seem strange, that clay, which requires more manuring than almost any other soil, should itself serve as a manure; but it answers excellently, when used with discretion. As the barrenness of most soils depends on the abundance of some one ingredient, there is scarce any one kind that may not serve as a manure for some other.

Nature succeeds by a mixture of several ingredients; which might, of themselves, be called unfruitful. The due proportion is the great matter.

Sand is barren, nor will a little mellow earth mixed with it, render it fruitful: in the same manner clay is barren, and tho' some mould be mixed with it, 'tis still hard, tough, and fruitless; but when clay is added to the sand and mould,

or

or when sand is added to the clay and mould in the second composition, either way there is made a loamy soil, which is sufficiently fruitful.

Thus nature gives fertility to these unpromising ingredients; and in the same manner we can give it by art. The first thing is to know what makes the soil barren; and the next to supply its defect. We can add sand to a clayey soil; clay to one that is sandy: and in this light it is that clay, which is barren in itself, under proper directions, serves as a manure to give fruitfulness.

Clay is, upon this principle, used alone in Staffordshire, and some other counties, as a manure to sandy, gravelly, and stony lands. For this use clays are taken as they came out of the pit; and the difficulty of mixing them well with the soil is well repaid by the fertility.

A loamy soil is preferable to a dry sand, or a scorching naked gravel; if nature had mixed clay with these gravelly or sandy soils, they would then have been loamy, and would have been more fruitful. What nature might have done, the farmer may do; and in adding clay he converts the sandy to a loamy soil.

The clay acts in a double capacity; it gives a firmness to the soil, enabling it to hold the roots of the corn, and to retain other manures; and by its natural coldness, it tempers the scorching heat of the others, which in dry summers burn up the crop.

Clay from the pits is better than such as is taken from the surface of the earth, because it is purer; and never had any growth upon it.

The best clay for the use of these soils is the red, the next best the yellow. But when there is a fairer mixture of earth with the sand, the blue clays answer best; for there is somewhat of a fatness in them which tends to the quality of marles.

The farmer who has a barren, sandy, or gravelly soil, should use the red or the yellow clay as a manure. He may have these lands cheap; and one good dressing them will last his life.

Clay, used as a manure, enjoys in common with marle the power of giving lasting fertility: in this respect it even exceeds marle, for the effect lasts longer.

I at this time know some lands that were dressed with clay near thirty years ago, and retain the fertility yet; and I dare say they will hold good ten or twelve years more. Upon
the

the edge of Buckinghamshire towards Middlesex, a farmer used a yellow clay upon his sandy field. The time is well known when this was done; and his crops at this day are a great deal richer than those upon the other fields, from which he is parted only by an hedge, and which had all the same natural soil.

There cannot be a cheaper or readier manure than clay; and fair experience shews its value.

As to quantity, moderation is the best rule. Too little of any manure cannot do any good; and at the same time too much in this case would be worse. I would advise the laying on about seventy-five load to an acre, to be encreased or diminished according to the particular circumstances: and the farmer needs not be disheartened, if it seems at first to want success.

There requires a thorough mixing of the clay with the soil, to bring it to fertility, and this is not to be done at once. A tough clay, though laid on ever so carefully, will remain in cakes and lumps, in some degree, for at least two years.

Upon this depends the improvements not being seen at first. As the marled lands do not come to their full richness till the second year, these clayed fields are not at the best till the third or fourth. But by this time, with good plowing and harrowing, the clay gets well mixed in; and then it produces accordingly.

I have known the first years produce of a clayed land, rather less than it used to be. But from this time it has grown better and better till the fifth, sixth, or seventh year; and from that time has held its degree of fruitfulness.

The farmer is not to expect such crops upon these lands, as on a good soil well marled, where the rent is higher, and the manure costs more: but computing all things, the improvement is equal.

Though clay, in the lump has been found barren in all parts of the world; yet it has been seen that when reduced to powder, it makes very good mould.

Upon this has been established the practice of calcining clay for the uses of husbandry: the advantages of which are very great.

It appears from the fertility of powdered clay, that it is not the substance of that earth which is unfriendly to the growth of plants, but its compact texture. Nothing is able to break that like fire; therefore burning has been discovered

covered for this excellent purpose. There are now many kilns built for that use, in different parts of the kingdom; in some of which thousand loads of red, yellow, and blue clay are burnt yearly.

The fire takes away all the toughness, and in this condition it is an excellent manure for corn lands of the looser and drier kind: breaking easily, and mixing thoroughly with the soil in a very little time.

There is also a black clay called Urry, found in coal pits, which is naturally crumbly, and mixes with any soil, giving it great fertility.

The husbandman will learn by this, not to despise any thing as a manure from its appearing unlikely to give fertility; for at first sight nothing could seem more unlikely than clay: and let him learn also not to despise projects; for this burning of clay was at first much abused under that name.

CH A P. XI.

Of the use of loam as a manure.

LOAM is a mixture of clay and sand: therefore as these are severally useful to such lands as want one or the other, this mixture of them is, in some places usefully employed in the dressing of lands that want both. I have placed it next after clay as nearest of kin to that earth, and shall add what I have seen of its use as a manure, for it is only from experience I shall write of it.

The use of loam as a manure, is more limited than that of any other kind, but it is in the narrow bounds allowed to it, not trifling.

Clay enriches a sandy soil by giving it a body: sand improves a clayey soil, by breaking its toughness. It is also used with success on some gravelly grounds: but there are some of these with which clay will never mix: for those loam, or a loamy earth, is the proper manure.

When a gravelly soil has a good deal of sand in it, or when it is full of ragged flints, or rough pieces of stone, it will receive the clay as a manure. But when the soil consists only of smooth round pebbles, and a little mould, the clay will never mix among it. Of this I saw an instance lately in Kent, which I shall set down as an example of the use of loam.

Thomas

Thomas Edmunds had two fields, the soil of which was made up of round blueish small pebbles, and a little hazel mould. To look upon the fields, any one would suppose them to be plain naked gravel; for the rain continually washed in the mould, and only the stones were to be seen.

He had try'd dung a year or two to no purpose. The gravel was too hungry for that manure. A clayey marle would have done well if laid thick enough, but there was none near: he had been advised to lay on clay, which he try'd only on one field, having no great opinion of it. The clay never mix'd with the soil, but lay loose after all his plowings, and did more harm than good.

The clay he used was yellow, and the neighbour who gave him the advice thought the colour was the reason of the failing. There was a pit of brick earth hard by: this was a redish loam. He took this for red clay, and advised Edmunds to try it on the other field.

He laid on the loam two and twenty loads to the acre, and after a couple of plowings it perfectly well mix'd with the rest. Not only the pebbles hung very well in it: but the mould turned up by deep plowing, mingled with the rest entirely and perfectly.

This field had been worked four years when I saw it, and it was then in excellent heart. The very nature of the soil was chang'd: one would not have believ'd, by looking on it, that it was ever the same with that of the other field.

I once in Hertfordshire saw loam laid on a dry sandy soil. This at first startled me, but he was a sensible man that did it, and he gave me a good reason.

This was a hard sandy piece of ground which would never take clay: the loam contain'd a great deal of clay, with but a moderate quantity of sand, and it broke and mix'd freely enough with the soil. So the farmer had the advantage of the clay which was contain'd in the loam, and the addition of sand was not great.

The husbandman must sometimes compromise matters; benefits cannot always be had entire. The harm this man did his ground by the sand was much less than the good it receiv'd from the clay; and therefore the balance was in his favour.

I have seen loam used as a dressing on a small field of a chalky soil. And the benefit was considerable.

Chalky soils are hot, dry, and loose; now the very nature

nature of a clayey loam is cold, moist, and tough. These qualities in the loam being opposite to the fault of the chalk, must needs correct and improve it. Thus that is often founded upon reason which at first sight appears the most strange.

Loam may also be used with advantage on those mellow soils, they have in Lincolnshire, which are so loose and light, that they will not give hold enough to the roots of the corn. Clay would be an advantage to these lands, but as clay will not mix with them, a loam consisting of a large proportion of clay to a little sand, will answer this purpose: the sand disposing the clay to break and mix with the mould, which otherwise it would not; and the small quantity of sand that goes in along with it, being of no bad consequence.

I have been the larger on this head, because loamy earths are always at hand; and their uses in husbandry are very imperfectly known. We see almost any thing will answer the purpose of a manure on some soil or other; and it is good to know all that can be used; that when one cannot be had another may.

Loam is a manure that leaves room for the advantages of any other. Dressings of dung come very well upon the lands after the loam, which puts them in a condition to detain their best parts.

A great art is, not to throw the rich manures away, upon what are called hungry, and loose soils; Loam gives these a body; and after that they will retain whatever is given them.

CH A P. XII.

Of the use of sand as a manure.

SAND, which is in itself the most barren of all things, may be used as a manure with success.

Every farmer knows sand is good to be laid on clay grounds: but we shall consider its uses farther.

For the more perfect understanding the advantages from the use of sand; and to prevent mistakes, the farmer should recollect what has been said concerning the three kinds of it.

These are sea sand, river sand, and pit sand. Sea and river sand, where they are both sharp and stony, are the same

same thing originally, being both no other than pit sand washed clean; but they differ in this capital respect, that the one is impregnated with salt, and the other not. The other kind of sea sand, which is made up only of shells broken to pieces: and some shelly matter is frequent in most sea sand.

We are therefore to distinguish four kinds of sand.

1. Pit sand; consisting of little stones, with earth among them.

2. River sand; consisting of the same stones only, the earthy part being washed away.

3. Sea sand; consisting of the same stones washed clean in the same manner, but with a saltness from the sea water, and some pieces of shells among them; and sometimes farther enriched by decayed sea plants and animals.

4. Shelly sea sand; consisting altogether of broken pieces of shells impregnated with salt, from the sea water.

To these may be added a fifth, but bastard kind, that is, the grit of roads.

These the farmer is carefully to distinguish, for they are different in their effect and value; and some of them will answer purposes to which the others are not at all fitted.

When sand is intended only to break and divide a tough soil, the cleaner it is the better; river sand is preferable to sea sand for this purpose. Common sea sand owes its value above that of rivers, to the salt.

In cold clayey grounds, where nothing is required but to break and warm them, common sand answers the purpose.

Pit sand will do: but any other kind answers better. The farmers say pit sand has not so much fertility as river sand. The truth is, the earthy matter among it blunts the sharp edges of the little stones, which break the clay.

For this reason river sand is better, and where that is not to be had, it is best to use the grit out of roads, or the sandy substance which remains in roads, when the light dirt has been washed away by the rains.

When beside warmth, the farmer wants to give richness to his land; let him mix rotted dung, or fresh hog's dung, or poultry dung with sand. This way pit sand does as well as any. I have seen great effects of this mixed manure upon a piece of land in Shropshire, where before nothing grew but the poorest weeds.

Another way the farmer may make pit sand useful: that is by laying it in the way of enriching ingredients. When

he cannot fold sheep, let him have a sheep house to feed them in, and let him lay on the ground a deep covering of common sand. This, as it receives the dung and urine of the sheep, will become very rich: and it may be removed from time to time, and fresh put in, till a large quantity is well impregnated.

Pit sand answers better for this purpose than any other, because the earthy matter about it detains the moisture.

When the husbandman is to improve a cold clayey land with sand, all he lays on it will be of no effect without frequent and careful plowings; by these, the sand mixes with the clay; and it would otherwise in great part run in between the clots, and lie unmixed and useless.

Clay mixed with sand yields to the plow, and receives the rains freely: and takes any kind of rich manure afterwards.

Loamy, gravelly, or chalkey soils, can never be improved by sand, and no one would think of laying it upon his mellow earth. The only soil therefore on which it can be used in that naked and simple state, is the clayey.

We come now to the uses of the two sea sands; the proper sea sand, which is like river sand, but salt; and the shelly kind.

These are not so limited in their use; for salt and shells are both serviceable for the enriching of land: sea sands are therefore useful in proportion as they partake of them. Some kinds of sea sand contain also a great deal of decay'd animal and vegetable matter, from the bodies of fish, weeds, and other things that rot among them. Only such sand as lies quiet can have this advantage.

Sea sand that is taken from a plain shore, is no way enriched but by the salt it contains: that in creeks and among rocks, where it is less disturbed, and where more weeds grow, and more small animals live, is commonly of this rich kind: and that which is taken up on beaks and points of land, usually consists almost entirely of shells. The point of the island of Shepey is covered to a great depth with broken shells in this manner. On the surface lie whole shells, and large fragments; but under these is a quantity of them broke so small, that they pass for sand, though the point itself is called Shellness.

That sea sand which has its peculiar virtue from salt only, is best when it is softest. The harshness of common sand is a valuable quality, because it is used to cut and break

clay: but as this sea sand is employed to enrich the land, there needs not in it this sharpness: and the sand of the smallest grain is saltest.

Of this kind the reddest is preferred by the farmers upon the Suffex coast. This they have learned from books: but what is there written has been founded on particular instances, and should not be made general. The people of Cornwall were the first that used sea sand as a manure: and they found the red kind the best; the reason is, that the red happens to be the finest grained sand on the coast of Cornwall; but this is not the case every where: they have on the Suffex coast a pale yellow sand, which is much finer and better than the red.

This shews the benefit of explaining the reason, as well as laying down the fact. Otherwise what is meant for instruction often misleads.

The softest and finest sand of this kind, is the best without regard to colour.

They say in Suffex the largest sand gives the most lasting fruitfulness, though the small-grained sort has the speediest effect. They fancy this, because they can see the other longest in the ground. It may be true when it is a clayey soil. Otherwise the salt is the great enricher; and it is of no use that the sand remains when that is gone.

Some drag up this from deep water, where it is always covered by the sea: but that which lies on the shores, and is wet and dry, is at times saltier and better. It should always be taken up wet for use, and carried to the land as soon as it is a little drained; and then the sooner it is plowed in, the better.

Sand from deep water costs most, because of the trouble of getting it: some think it better because it is dearer; but it is worse. I have seen as much effect from ten ton of the shore sand, as from fifteen of the deep water kind.

The soil this sea sand best suits, is a poor clayey or loamy one: the quantity to be laid on is from eight to eighteen ton to the acre: I have seen five and twenty ton used; where it was ready and came cheap; but this is too much. Where the sand has been a great way off, I have known a farmer satisfy himself with two or three ton to the acre: but he might as well have done nothing.

From small quantities there comes no good: and by the laying on an over load, much damage may be done. The soil may be injured in the end, by being made too sandy:

and even as to the saltness, that may be over-done; especially when the sand is laid on very wet. We know by experience, that although salt in a due degree enriches land, yet in too large a quantity it causes barrenness.

Let the farmer manage this valuable manure thus. Let him dress his barren clayey grounds with it: they will be brought to yield very good crops by this, with a very little dunging afterwards.

In general nine or ten ton is proper to an acre, and as this manure takes effect immediately, the first crop should be wheat. After this, the farmer may have three other good crops of corn, and then it is adviseable to lay it down for pasture for five or six years; mowing it the first year; and afterwards feeding cattle on it. When this manure is used, the grass exceeds all other in sweetness.

The warmth this manure gives to land is surprizing. Snow scarce ever lies upon those grounds that have been well sanded; and the warmth, and richness of the manure, make a spring even in winter.

Sea sand, taken from still places among rocks, and in creeks, beside its salt, has a vast richness from the decayed plants and animals. A little of it goes a great way; and there is no land whatsoever that will not be improved by it. Even in sandy soils the addition of this sand, unless it be a very dry one indeed, will do little harm, in comparison of the good of the animal and vegetable part.

This is used in Cornwall with great benefit: five ton to an acre is a very fair allowance of this: and I have seen crops from it that were astonishing. It suits very well with wheat, but best of all with barley, and it always gives a richness to the ear. The stalk of barley sown on this ground is short, but the ear long and thick; 'tis often two thirds of the length of the stalk. This has been said of the manure by sea sand in general, but in Cornwall where this barley is so fine, it is where this foul sea sand has been used and no other. It is this enriched sand alone that gives the great fruitfulness.

The grass that grows upon lands that have been manured with creek sand, is also preferable in richness to any other. This is found by the graziers, for none feeds cattle like it. 'Tis like the barley; short, but full: it does not run to stalk, but the leaves are numerous, and the head rich. It is always full of white clover, which is a very

very nourishing plant, and there is such heart in the land, that the growth is speedy, and the sward always fresh.

Other sands suit particular soils; but the farmer who has this within any moderate reach, is sure of a treasure: for let his land be what it will, this agrees with it; and it need not be renewed oftener than once in ten or twelve years.

That sort of sea sand which contains a great quantity of sea shells, or is altogether made up of pieces of broken shells, and is thence called shell sand, has the common advantage of sand, for it will break and divide a tough soil: and it has also the farther benefit of enriching it in a very considerable manner.

There are two accounts on which sea shells enrich a soil. They are in their nature something of kin to marle, especially when they have been well calcined; and that is the condition of those which are thus broken and exposed on the shores. And as they have been a part of animal bodies, they partake of an animal nature: and all things that do so, are rich.

This sand agrees particularly with barren heathy land, that has a clayey soil, and is naturally over-run with fern and furzes. The common hazel mould is also greatly enriched by it; and the fruitfulness which it gives continues a long time. The corn that grows on these lands has always a short stalk, and a large ear; and the grass is short, but thick, juicy, and sweet.

The colour of this sort of sand may give a rule for judging of its quality. The more shelly matter it contains, the richer it is; and the less that shelly matter is calcined, the longer the improvement made by it lasts; the whiter it looks, the sooner the effect is seen. This is natural, because the white shells are calcined already, and give out their virtues at once. The others are to be calcined by the sun and air as they lie on the ground: this is done gradually, and the improvement advances in the same manner.

This is seen evidently in the effect of the shelly sand in *Suffex*, and *Cornwall*. The *Suffex* kind in general consists of a good deal of yellowish sand, with a great quantity of broken shells in white pieces among it. These are cockle shells for the most part, broke by the dashing of the water, and calcined by laying on a flat shore. The *cornish* shelly sand is blueish or ash coloured; for it consists

sifts of some white sand, with a quantity of broken muscle and limpet shells: these not being exposed in general on so flat a shore, are less calcined by being left dry to the sun and air.

The Suffex shelly sand enriches land immediately in the manner of dung; but it does not well support more than three crops of corn: after this they have five or six years good grass, and then repeat the dressing.

The Cornish kind does not shew its effects at once, but the four or five succeeding years it yields excellent crops of wheat or barley; and after that, affords a much stronger grass, though as sweet as the other.

C H A P. XIII.

Of the use of gravel as a manure.

MANY things are to be considered as manures, which will surprize the unexperienced; and this of gravel is one of them. But those things which of themselves make bad soils, often serve to improve others. Sand and clay are two instances of this, and gravel a third.

Gravel making of itself a hot soil, is good to be used to those which are naturally cold. Cold lands are mostly tough: and the gravel at the same time that it warms, breaks them; and gives way to rains, and to the roots of plants.

As breaking the toughness is one great point in the use of gravel as a manure; the best kind is that which is full of rough and ragged flints. This will warm a soil as much as that which consists only of round pebbles; and will break it a great deal more.

As clayey grounds are most improved by gravel, the farmer must take care there is no clay hanging about the stones, as is the case in many pits: he should also have all the large stones picked out.

In Buckinghamshire I have seen a clay field manured with a rough gravel, and afterwards with dung: and the consequence was a very good crop.

This was a ragged flinty gravel, and there were few of the stones bigger than a walnut.

Another improvement I have seen by gravel in Northamptonshire, in a different way, but this was also on a clayey

clayey soil. The farmer had wasted a great deal of good dung upon it, when at length an accident relieved him. The soil was shallow, and under it lay a flinty gravel with a great quantity of petrified oyster-shells. He one year plowed deeper than ordinary, and turned up a good deal of this mixed gravel with the soil : the next crop was four times greater than the land ever produced before.

The gravel in this place was improved by the shells, in the same manner as sea sand often is. Many sea shells when petrified, become absolute stone ; or there is nothing but a lump of stone bearing their resemblance ; but in oyster-shells it is usually otherwise, and in none so much as those of this county : they are turned up frequently, and though they be in part stony, they have always something of the shell remaining. They are flakey, and they split and moulder to pieces, after being a little exposed to the weather, and act entirely as calcined shells. Wherever there are sea shells found in the earth, if they are not petrified, they are always brittle, and as it were calcined.

The only soil beside clayey, in which gravel should be as a manure, is the most nearly allied to clayey, the loamy soil. The sand in this soil is sometimes so little in proportion to the clay, that the earth rises in great clots from the plow, and gets into cakes with the wet. In such a soil gravel will be a good addition.

This is a conjecture founded on reason. Gravel would prevent the soil from running into these great cakes and clods ; and the sand would then be able to keep the lesser lumps divided.

CHAP XIV.

Of the use of stone as a manure.

IT may appear strange to name stone as a manure, but the use of it is supported by practice, by frequent experience in Oxfordshire, and some adjacent counties.

The practice has its foundation in reason. In speaking of the soils, we have named some of the stony kind, which the farmers like better than the same kind of grounds where there are no stones.

In treating of gravel, we have advised the husbandman to prefer such as has rough and irregular flints among it, and we have given a reason.

On these observations, the use of stone as a manure, is supported both by experience and reason. If of two fields otherwise the very same in soil, the one having stones among it, is fruitful; and the other not having any, is barren; it is plain that stones being laid on a barren ground of that kind, will improve, and make it fertile.

Reason also shews, that if that gravel is best for manure which is fullest of rough stones, they being more apt to break the toughness of a soil; then a parcel of rough stones without pebbles, must be better than any gravel whatsoever.

As a great use of gravel is warming the soil, so pieces of lime stone will answer that purpose better, because these stones are in their nature warmer than flints or pebbles.

Having shewn the reason of the thing, we shall now add what is known from practice.

In Oxfordshire there are large tracts of a cold, tough soil. They bestow a great deal of manure of the common kinds, upon this land in several places to little purpose; but about Banbury, particularly at Hornton, they have found a way of manuring it with the chippings of stone to great profit.

There are quarries of stone in that neighbourhood; and the pieces that fly off in hewing out the blocks, are spread upon these plowed lands, and worked in by degrees. They mix thoroughly with the soil, and give it a lasting fertility.

The benefit is lasting, because the manure remains a long time; and though these pieces of stone break by degrees with the weather, they still retain the power of dividing the soil.

We have an antient record of the use of stones in rendering the earth fertile. Some foreigners who came to Syracuse, and practised husbandry, proposed great improvements in all the neighbouring lands. The first step these indefatigable people took was, to pick out all the stones from the plowed fields: and this they did so carefully, that after three plowings there was not a pebble of the bigness of a nut to be found. The lands produced scarce any thing. The crops were not comparable to what they had been before. And the new farmers could make nothing of their undertaking, till they had laid the stones on a gain.

After

After this they continued their other labours of deep and often plowing, weeding, and the like; in which they were more industrious than any people, and they succeeded. The manures they had used when the stones were off took no effect; but as soon as these were laid on again, they enriched the land according to their nature.

This seemed a miracle to the people of that time. They made nature a goddess, and said she would not be put out of her course. But the farmer who understands the nature of cold clays, and the effect of stones in breaking and dividing such soils, will be able to give an account of this impoverishing the land, by removing the stones, and enriching it, by laying them again in their places, without having recourse to goddesses and miracles.

It has pleased the creator of the earth, to cover it with different soils; and in some places to leave it more barren, in others naturally improved. We are to use our understanding in observing what is the kind of that natural improvement; and our industry in imitating it: imitating nature is obeying God.

We see from the old instance in Syracuse, and the modern observations in Oxfordshire, that stones, especially the rough kind, being in a corn land, are a great advantage to its fertility. Nor is the practice either new or particular. It is not new, for it is mentioned as in common use by Dr. Plot, who wrote near eighty years ago; so that, doubtless, it is there a practice of more than a hundred years standing; nor is it particular, for I have seen it done in Sussex in more than two or three places. They there lay on the bits of stone with the dung; but the other is the better practice.

CH A P. XV.

Of the use of chalk as a manure.

CHALK as a manure can never be too much considered; or when rightly understood too much employed.

It is one of the most distinguishable manures in its effects, which last a great while, but are apt to leave the land poorer than it was before, unless some care be taken to prevent that mischief.

Chalk agrees perfectly with the two worst soils we have: A tough clay, or a bare sand, are both greatly improved by it. But of this it must be observed, as of other natural and earthy

earthy manures, that it makes way for other dressings; and prepares the ground that it improves, for being enriched by every other means.

Chalk is a general name, comprehending many kinds of different degrees of hardness, and fit for various purposes; the farmer is to take care that he chuse a right kind.

Chalk must be crumbled to powder by the weather, before it is fit to answer any great purpose. He will therefore prefer that chalk, which is best suited to receive the effects of the air; and that is the softest.

Chalk burnt into lime, is used with great benefit as a manure; and the effect of the air, in breaking and mouldering it to powder, is a sort of calcination, though in a less degree. It is preferable to the other: for as it is less violent, it leaves more heart in the chalk, which is the occasion why the effects thus last, by many years, longer than those of lime, though the effect of lime is more speedy.

The chalk which is softest and fattest, is the most free to take the influence of the sun, air, and rains. It will not only break much sooner, but breaks also more perfectly than the stony kind; and it is therefore always to be preferred, though brought farther, and at more expence.

The hard stony chalk will scarce break at all. I have known many a farmer make a great mistake, by supposing it would mellow and break when on his land. He has therefore plowed it in, in lumps, after its being exposed the usual time to the air. Such have more than once complain'd, that their chalk took no effect; and I have shewn two or three of them the reason, by taking them to their ground, and making them see the lumps quite unalter'd after two or three years.

There are chalks so stony that they will hardly break with the water at all. These the husbandman is to reject, unless he intends to burn them to lime. The chalk he is to chuse is the soft kind, which usually lies at a small depth in the ground, under a coat of yellowish marly clay. I have found beds of this chalk in many counties, and always covered in this manner.

This kind really approaches to the nature of marle, and a winter's frost and rain never fail to reduce it to a condition of mixing thoroughly with the soil. Being mixed in this manner with the toughest clays, it brings them into a light and hollow condition, in which the rains and weather penetrate them thoroughly, all rich manures enter perfectly into their

their substance ; corn can easily shoot through them, and they yield freely to the instruments of husbandry.

A soil that works easily, takes dung well, and gives free growth to the crop, at the same time that it has a sufficient body to hold up the stalk, is a great advantage. This he can only have in the present instance from his knowledge and industry. It is a soil he makes out of a clay well chalk'd and well dung'd, for there is no such in nature.

There is no instance wherein the mixture of soils so plainly shews its advantage, as that of chalk and clay. Both are naturally barren ; but being mix'd they are capable of producing any thing.

Chalk takes most effect on those lands, which have none of it in their own nature ; nor have ever had any laid on before. It changes the very nature of the soil. One plowing upon a clay land that has been chalked, will go as far as three upon one that has not ; and such a soil, instead of being slow in its produce, pushes too fast, and if not preserved by rich manures, or recovered by due rest, after a proper time, will be perfectly exhausted.

To prevent this, which has cast a reproach upon chalking, we advise the owner who dresses his proper land, or the conscientious farmer, not to lay on his chalk alone, but to mix one load of it with three load of dung, and a load of river mud. This will keep the land in heart, as well as give it that pushing quality : and it will, after the power is over, receive another dressing of chalk with the same benefit as the first.

The chalking lands in this manner, will answer like the marling of them, where they renew the dressing once in ten or twelve years, and keep working the land from one generation to another.

The fault that is charg'd upon chalk, is rather to be laid on the husbandman. There are many ways of ruining a piece of land, and this is one. But chalk may be so managed, as to enrich it for ever.

The farmer generally succeeds best with chalk, who brings it farthest. In Buckinghamshire they bring it from pits, opened for it in particular places. In many parts of Hertfordshire, where the chalk runs in a thick bed, at some depth under the soil, they dig for it in the middle of the field where they intend to use it : Chalk, upon a proper soil, will do great service any where. But although of great service

vice in both these counties, it is of much the greatest in the former.

The quantity of chalk laid on in these places, may also shew that it takes much more effect in Buckinghamshire, where it does not lie under the land, than in Hertfordshire where it does : for the farmers are guided in their quantity of manures by experience. In Buckinghamshire they lay fourteen load upon an acre ; in Hertfordshire the common allowance is twenty-five or thirty, and the effect in the former county is considerably greater.

This is owing to there not being a bed of it under the soil in Buckinghamshire, for if there did, the farmers would not go farther to seek it. The soil usually partakes of the nature of the beds of matter that lie under it.

In Hertfordshire the effect of a good chalking lasts twenty years, if the farmer understands his business, and does not over work it : in Buckinghamshire, where but about half the quantity is used, it does not indeed last above fourteen or fifteen years, but then the land is ruin'd in one ; whereas, in the other, if a little care has been taken in the first dressing, it is ready to receive another, with the same advantage.

The farmer should dig chalk in the beginning of October, and let it be exposed to the rains and frost all the winter ; in spring it should be beat and spread about, and plowed into the ground. After this the corn is to be sown ; if barley, and a fair allowance of foot spread over it. This is the common practice where this manure is best understood.

The practical reader is to suit this to his particular occasions. If he have a very fine and soft chalk at hand, he may lay it on immediately from the pit in spring : for the sun and air, during the winter, only exhaust such a chalk ; and they are not needful for the reducing it to fineness.

If he can get no other than an hard and stony kind of chalk ; let him break it small, and expose it upon a lay a year or two before it is plowed up : this will give it time to moulder, so that it may the better mix with the soil when plowed ; and, at the same time, the rains will be washing some virtue out of it, which will be gradually received into the land.

The use of chalk is, in a manner, confined to arable lands ; but I shall give the farmer a piece of advice, as to the laying it on his pastures.

The first year I used chalk on my pasture grounds, I was afraid

afraid I had thrown away my labour : and perhaps many have been discouraged in the same manner. I perceived that my grass was not a whit the taller or fuller for it ; and therefore I at first thought it did no good : but I soon found by my cattle, and in my dairy, that chalk gives a richness to the grass, though it does not encrease the quantity : my cattle fatten'd better upon this than I ever knew them upon any pasture of the same kind without chalking ; and I never saw so rich milk as I had from the cows.

I recommend chalking of pasture grounds therefore, as much as laying it on plow'd lands.

Chalk must be very mellow and crumbly before it is laid on a pasture, otherwise it does more harm than good. If it be mellow in its own nature, it must lie a while expos'd to the weather ; and the harder it is, so much the longer. Chalk is never fit to be laid upon pasture grounds, till a man can crumble any lump of it to pieces by treading it, or rolling it about a little under his foot.

In some parts of England the farmers spread chalk upon their lands, after they have marled them : but this is quite unnecessary. It is one of the practices of the antient husbandry, and we know how difficult it is to beat the country people out of the old tract. It is recommended by Markham, and others of that time, who always advise the mixing many dressings ; and often direct every sort of manure whatsoever, to be laid one over another upon the same field.

These writers may often assist the farmer ; and it would be better for the country in general, if they were more observ'd than they are : but the practice of ingenious and industrious persons since their time has greatly improved the art of husbandry.

C H A P. XVI.

Of the use of salt as a manure.

SALT affords an instance of that excellent rule, that things may be good in moderation, though destructive in excess. We read of fields sown with salt in order to make them barren : but we also know by experience and observation ; that salt in a due proportion is a great cause of fertility.

Accident, which is as often the mother of improvement, as necessity is of invention, first led the way to this rich and
ex-

excellent manure. But it was accident attended with observation: without that, heaven and earth point out advantages to mankind in vain.

There long prevailed an opinion, that salt gave barrenness to land, and none would ever have disputed the fact, much less have thought of salt as a cause of fertility, but for the observation of what follow'd where salt had chanc'd to be thrown upon lands in a moderate quantity.

In Devonshire a piece of plow'd land was overflow'd by a spring tide, that rose higher than any other had done in the memory of man. The farmer who rented it at a small price, had got little hitherto: but the season succeeding this overflowing, he found his crop ten-fold, though he had used no other methods of dressing that field. The consequences of which were so plain, every body must see them. If salt added to land by accident made it fruitful, it would have the same effect if added purposely. On this reasoning they began the practice, and it succeeded.

This was the introduction of sea salt as a manure in Devonshire, the place where it was first used in England.

Worcestershire was the next part where it came into repute, and that also from an accident, though of another kind. In Worcestershire they have salt springs: the water of these is a perfect brine. It is stronger of salt than sea water any where, and the salt is the same.

That when this water dribbled to waste, they saw the ground was quite barren over which it ran; but all about those places, the grass grew much fuller and finer than elsewhere. Upon this they began to use weak brine in moderate quantities; first on their pastures, and afterwards on their plow'd lands with great success.

After this, people observing those salt marshes that lay at a favourable distance from the sea, and had the benefits without the mischiefs arising from salt water, began, on comparing their crops with was practis'd in the before-mention'd counties, to understand truly the nature of salt as a manure.

The old writers on husbandry in our own language, were acquainted with the use of salt much better than those who condemned it at all adventures, as a cause of barrenness. They understood the advantage of sea sand over river or pit sand, and they were sensible this was owing to the salt.

They advis'd those farmers who lay too far from the sea, to sprinkle salt upon their corn lands. They prescribe the strewing of this in the manner of corn, thinly and evenly
over

over the ground : they call it sowing of salt, the quantity they direct is two bushels to an acre.

One thing more is to the credit of these authors. They direct bay salt, and that is more of the genuine nature of sea water than any other. It is made by exposing sea water to the sun and winds in shallow pits ; and the common white salt is made by boiling sea water over the fire. This last method evaporates every thing that was in the water, except the salt and stony matter ; and therefore this has no taste but saltness : whereas bay salt which has had no heat but of the sun, has a sensible taste beside ; and contains more of the natural principles of the sea water.

The steeping grain that is to be sowed in brine, is a practice well known ; and this confirms the account, that salt in moderation is useful to land. It was discover'd by the same means, by perfect accident. The loading of a ship that was cast away was wheat : the wheat was afterwards sowed, and was found to thrive better than any other.

This soon brought into use the steeping seed corn in brine, and long practice confirms that it not only makes it grow stronger, but prevents smut.

The mud of salt water ditches has been of late brought into use in Essex ; they mix it with lime and mellow chalk, and it makes an excellent dressing for the poorest, and most barren lands.

The farmer can never do amiss who uses salt in this design, except he use too much. Moderation is the great rule of life : he that can't practise it will thrive in nothing. We advise in the first bringing barren lands to fruitfulness, to use three bushels to an acre : afterwards one bushel is sufficient. It suits all soils ; and the best time of laying it on is with the corn in sowing : the first rain thoroughly dissolves it : it then penetrates the surface, and is of use to the shoot as soon as it is made.

C H A P. XVII.

Of the use of sea weeds as manure.

THE benefit of sea weeds is confin'd to those parts of the kingdom which are near the sea coast, for they must be used in quantity : but it is an advantage too many neglect, who have it ; and few are greater.

All vegetables are rich manures when in decay : salt is also

also a very rich dressing : now sea weeds have the double advantage of their own vegetable nature, and of the sea water in which they grow.

There is something more than this in their favour. Curious persons who have examin'd them according to chemistry, find they contain much the same principles as animals : and it has since that been discover'd by the help of glasses, that they are always crowded with little insects that live upon their slimy surface, or in their little hollows. This is so strongly visible in many of them, that some ingenious persons both in England and elsewhere, have suppos'd many of them not to grow as plants, but that they were made by those little creatures *.

When we consider the sea weeds in this light, what a right have they to the husbandman's regard as a manure, from their nature, and from their saltness.

In Devonshire, near the coast, they use the ouze and mud drag'd up wherever they conveniently can get at it, as a manure. They take this, weeds and all, and let it rot together, before they spread it on the ground : this is a very rich manure, but the benefit is laid to the mud ; the weeds are not much regarded.

In Cornwall, where the shores are sandy or stony, and they cannot have this easy advantage of salt water mud, they tear off the sea weeds from the rocks and stones ; and take together such as are cast up by storms. These they lay upon the ground without any preparation, plowing them in, and they enrich it to a surprizing degree.

The first year many of the tough kinds remain almost entire in the soil ; but they give a great deal of fruitfulness to it notwithstanding : the next season they generally break and rot, and they continue nearly equal in point of fertility that, and the succeeding year.

The first year, the salt fertilizes the ground ; the next, and the third, their own substance decays, and enriches the soil ; the smaller and tenderer kinds the first year with the leafy part of the others ; and the toughest and the remaining stalks the last.

In Cornwall they pile these weeds in heaps, and cover them that they may rot before they use them. This makes them take effect in a prodigious manner the first year, but they do little the second, and the third less. It is best to use them just as they are taken up : for their first effect this way is sufficient ; and the benefit lasts longer.

Of

Of all the manures, none is so quickly spent as rotted sea weed ; but none takes a quicker effect.

C H A P. XVIII.

Of sea shells and their spawn as a manure.

THE nature of shelly sea sand we have explain'd in its place ; and sea shells in any state may be used as a manure ; and that in different manners according to their condition.

Some are taken up fresh ; others have lain in heaps expos'd to the weather : some are hard and firm, others soft, brittle, and as it were, chalky : these severally require a different treatment.

Shells have a double title to be used as manure. Whatsoever has been a part of an animal, or has any way belong'd to one, is sure to be useful to this purpose : and they are, after exposure to the air, of a limy nature.

Shells taken fresh out of the sea, or from the shores, have a bright glossy look on their inside. Those which have lain to be calcin'd upon the beach, are all over whitish, and have a dead aspect : these have somewhat the appearance of lime ; and a calcination by fire in the common way, soon brings any shell to real lime.

These are the three conditions in which we are to consider sea shells as a manure. 1. The fresh shells ; 2. The shells that have lain on the shores till they are calcin'd by the sun and air ; 3. Shells calcin'd by fire to lime.

The farmer is to use one or other, according to the nature of his ground : the first and second are usually found together ; and he may make lime of either at his pleasure.

The spawn of shell fish, is a richer manure than the shells. This is found under rocks, and sometimes in vast plenty in the beds of salt water rivers. It is full of small shells. It dissolves easily : and is a great enricher of poor land. It is so much above dung, that the farmers reckon one load of it equal to three of the other.

When the ground is poor and heathy, sea shells are to be used in their natural state : and the fresh and lively shells are better than those which have lain expos'd till they are bleached : but when a tough soil is to be dress'd, the best way is to calcine them to lime. If natural shells are used on a stiff

loamy soil, those which have lain till bleach'd, are better than the fresh.

No shells are to be laid on whole, for they would obstruct the shooting of the corn, and it would be many years before they could give out their virtue. The farmer must break them with hammers, or in a mill, the smaller the better: for then the air takes quick effect upon them. Most shells are made up of plates lying one over another, and when the air can get freely at the edges of these, they split and shiver to pieces; and then give out their virtue to the ground.

In Suffex shells are used both ways. I have there taken up a shell tolerably entire and sound, that has been lain on the land three years, by one who laid them on whole: and this in all that time had obstructed the growth of the crops, and given no virtue: whereas on a neighbouring farmer's field who had ground his shells in a mill, nothing was to be found remaining of them but a few thin shivers; these were as brittle and crumbly as the thin shells we find in marle pits; and doubtless they are as rich.

These broken shells had been laid on no longer than the whole ones in the other man's field; and I doubt not but in another year, there was not a scrap to be found: whereas the others would probably remain whole for his life.

As shells that have lain to be bleach'd on the shores, fall to pieces sooner than the fresh ones: it may be right where the nature of the soil renders lime improper, and where only fresh ones can be had, to calcine them a little. Half an hour's gentle fire will do as much as some years lying upon the beech: the hardest oyster shells may be thus made soft and crumbly. They will then easily break under the hammer, or in the mill, and will dissolve upon the ground in a season or two, and their effect will be seen a great many years.

Those who have understood the nature of manures, especially the richer kind, agree that they cause fertility by raising a ferment in the land, dividing the lumps, and loosening and mellowing the soil. If this be the case, experience shews, that sea shells, properly manag'd, are the richest of all manures, for none loosen and mellow the earth in such a manner.

A thorough dressing of shells enriches land for many years, and indeed too much at first, for after a few seasons when they are well dissolv'd, they make a soil that was before stiff, so light and loose, that it is not able to support the

roots of the corn. In this case the farmer should lay it down for grass two years, and then plow it again. It bears excellent sweet grass, and afterwards has body enough to support a crop of corn.

The right allowance is twenty loads of shells to an acre : when they are burnt to lime, they take effect the most suddenly, but it does not last long. When they are calcin'd a little, so as to make them crumbly, they affect the land gradually, and their virtue will last twelve or fourteen years : when they are used in their natural condition, the effect is slower : those which have lain expos'd till they are bleach'd, exert themselves quickest ; and these last, as before observ'd, on some lands hardly ever take effect at all.

'Tis best always to use the method of half burning the shells, unless upon those barren and cold soils where they do best as lime : the other way they take effect too slowly.

In Cornwall they use the bleach'd shells, and their effect is very strong for ten or twelve years ; in Devonshire they have softer and brittler shells than in Cornwall, as small cockles and razor shells : they spread these as they find them, and they do very well. About Plymouth the shells are mostly of the muscle, and other thin kinds, and they use them fresh as they find them, only breaking them with an iron stamper ; but in all these places they would answer a great deal better with a little calcination.

In Ireland they use the fresh shells from Lough Foil, or the bay of Londonderry, bestowing fourscore barrels on an acre, and the archbishop of Dublin has given a surprizing account of their fertility ; which is publish'd in the philosophical transactions.

The advantage the farmers about our sea coasts make by this shell manure is very great ; but I have seen this as well as the other benefits offer'd by nature, neglected so often, that too much cannot be said to spirit up the farmer to employ them.

C H A P. XIX.

Of parts of trees and plants used as manure.

ALL vegetable matter when it rots and decays, becomes a rich manure. We shall here for the farther assistance of the husbandman, mention those particulars which are most ready and most useful in this kind.

All large weeds are good to mix with dung in the yard, or in a pit, and the most juicy are the best. They must be cut up before they run to seed; and the more perfectly they are rotted, the richer they prove.

Dead wood, which is found in some quantity in forests, and is so rotten that it will snap, and almost crumble between the fingers, is an excellent manure. The branches of trees that lie cover'd with leaves, and the decay'd stumps of others that are reduced to a blackish matter, which is light and spongy like touch-wood, which are not uncommon in damp places, should also be collected by the careful farmer for this purpose.

I have seen these used alone in Lincolnshire, where a piece of corn land upon the edge of the fens was manur'd with decay'd willow stumps beat to pieces: and about Charlton forest in Suffex, the farmers buy the rotten branches of the stees of poor people, who pick them out of the lower parts of the forest, and mix them with their dung.

The Suffex farmers agree, that nothing enriches their soil so much; and I am a witness in the other instance, that rotten willow wood alone is a prodigious improver of land, for I saw the crop, which was a very fine one, though the land was naturally but indifferent.

The farmer should at leisure times employ people in getting together weeds and decay'd wood to add to his dung, if it were only to encrease the quantity: for there is hardly an article of more concern to him in all his business, than the making up enough of his manure. But beside that advantage, these things add to the richness: as decay'd vegetables are themselves a very fine manure; and as a mixture of manures of these kinds always adds to the strength of both.

The decay'd leaves of trees are worth his regard also: they add but little to the quantity, but they very much enrich the mixture.

Barks of trees are as serviceable for manure as any other part, and their virtue lasts longer. Not only the naturally rotted bark is excellent for this purpose; but that which has been used by tanners: this gives a great fertility, and its effect will continue several years.

Saw dust is also useful; for a little wet, or a short effect of the weather perfectly decays it; and the effect is more speedy than that of tanner's bark; but it is not so lasting. Malt dust, and oil cakes are also beneficial in the same way; and

and when the farmer can get them, he never should neglect the opportunity.

It depends upon accidents whether he can have these articles in any quantity ; but wheresoever they fall in his way, they are a great benefit.

C H A P. XX.

Of parts of animals used as manure.

PARTS of plants, as they are all of a rich and fertilizing nature, deserve the farmers great regard as manure. A proper attention has been shewn to these of late ; and many things never before thought of, have been introduced as manures, especially in the neighbourhood of London.

The convenience of having manures of particular kinds, is a great article : some fall in the way of one, some of another ; but he who would make the best of his land, must have a thorough knowledge of all the kinds, that he may take what he can procure : never let him concern himself whether the thing have been ever used by his forefathers, or their neighbours. For what is good manure in Kent, is sure to be the same elsewhere, provided it be applied to the same kind of land.

He will here see a detail of a great many parts of animals, which are in different places used as manure, and let him lay hold of any that he can get : farther, as he finds so many different parts of animals are used, let him be sensible that any other may. Every thing of the animal kind will enrich his land.

Whether chance or judgment directed people at first, they in all places use as manure such animal substances as come in their reach.

Upon the coasts of Norway they dress their land with the refuse of fishermens boats, who cure cod and herring. In Newfoundland they do the same : and in both these places the success is very great. These people have not learn'd of one another : but either accident, or a knowledge of the nature of things, has instructed both. Let the farmer who lives in the way of this manure, from these instances know its value. Perhaps one of the advantages of the present well establish'd herring fishery, may be the enriching some of the worst lands in these kingdoms by means of the refuse.

The farmer who lives in the neighbourhood of a large

market town, may with great profit traffick with the butchers, and all other persons who can furnish him with the refuse and offal of oxen and sheep. The blood, hair, and every other kind of rejected matters being rich for his purpose.

Wool-nippings, the refuse of rabbits skins, call'd coney clippings, and the hair of any creature whatsoever, are all fine manures.

These last named articles do not give a lasting richness, though great for the time. The farmers in many counties, however, know the value of them so well, that though their virtue is quite spent in two years, they find it worth while to buy them at seven, eight, and nine shillings a bushel.

The way of using these is to spread them thinly and evenly over the ground, at the rate of about thirty bushels to the acre. The first rains wash in their virtue. And the crop sufficiently shews its excellency.

Next to the hair come the hoofs of cattle, and other tough parts. No matter what creature they belong to, they are all equal in richness.

Old writers say the farmer is to use only the hoofs of such creatures as chew the cud; but that is an idle fancy, all are of the same efficacy: the only difference is, that the thinnest, and those of the youngest animals enrich the ground the quickest, and the thicker and tougher have the more durable effect: though they are all very lasting.

The way of using these is to spread them upon the land, some time before plowing, that the weather may dispose them to part with their rich parts: they are then to be plowed in, and the land will have the advantage of them fifteen or twenty years.

These manures agree with all sorts of soils.

The horns of cattle are too tough and cumbersome to be laid upon the land, in their natural condition, but they have the same enriching quality. Shavings of them are to be had at the horners and lanthorn-makers in London, and these are so thin the weather is able to affect them. The Hertfordshire farmers are acquainted with the value of these shavings. Though they pay a large price for them, they go a great way and last a great while, so that it answers very well.

The way of using these is to strew them thinly and evenly over the land, and after a time plow them in; they mellow the earth gradually, and encrease the produce in a manner that is surprising.

C H A P.

C H A P. XXI.

Of dung in general, as a manure.

HAVING treated of the parts of animals, as they may be made useful in the improvement of land ; we come next to their excrements, or dung ; which furnishes the great standing article of manure throughout the kingdom,

However sensible the farmer may be of the general use of dung, there is a great deal to be said of the particular kinds ; and their distinct and separate uses : there is as much difference between one dung and another, as between chalk and marle ; and there requires as nice a judgment in suiting the kind to the soil ; and in the proper time and manner of using it, as in any branch of husbandry.

The dung of different creatures is rich in various degrees, and suited to different purposes. We shall treat of this under its distinct heads. But first we shall give a general account of the nature of this capital manure, and the manner wherein it operates upon land.

The purpose of all plowing and manuring of land, is to divide and break the body of the soil, which is, in most kinds, naturally too compact : for the more the body of the soil is broke and divided, the more free passage the roots of plants have ; and the more they have the advantage of it.

In plowing, this breaking and dividing is done altogether by labour ; but in the use of dung it is effected by a kind of fermentation. All dung is naturally disposed to ferment ; and what is liable to ferment of itself, will ferment and work up a large quantity of any proper matter among which it is mixed.

A little yeast ferments a great deal of dough ; puffing it up and rendering it lighter : in the same manner dung works up and loosens the ground. This makes the soil mellow ; and this is the natural and real use of dung.

We see how the use of shells mellows a soil ; making it sometimes so loose and crumbly, that it has not body enough to hold the roots of the grain. The same is the effect of dung, only more moderate ; as we commonly use it : experience having guided men pretty well in the quantity, though not sufficiently in the choice.

We know this is the true use of dung, for plants of all

kinds grow better upon land that has been dunged ; than they will upon an heap of the dung itself. So that the dung does not directly nourish the crop, but makes the earth more fit to nourish it, by breaking and dividing the earth.

This may shew the farmer how he is to dung his light soils : of this we shall speak particularly hereafter, but in general, pure dung, laid upon a sandy soil has no effect, because dividing the soil is not what is there required. The little stones of which sand is composed, are not joined together ; and dung has not the power of breaking or dividing each separate grain.

In the gardeners grounds about London, where they force their herbs to grow, in a manner, in dung, we see the bad effect it has on them. A gardener's turnip has not half the sweetness of a field turnip : and the water which has boiled one of these dung cabbages stinks ; whereas there is no ill smell, but rather a musky sweetness, in that wherein a cabbage has been boiled that has grown in a more natural soil.

The farmer will never dung his fields in this abundant manner ; but if he should, even the corn would have a taste of it. This suffices to shew, that the true use of dung is to fit the earth to afford nourishment, in the fullest manner, to a crop ; and not to yield that nourishment itself.

Beside this natural effect in breaking the soil, there is another very considerable one in all dung, when properly used, that is, the giving a warmth to the land, and cherishing the young shoot. This is owing to the same cause, the fermentation of the dung : for that is the occasion of the heat it has in itself ; and which it so freely communicates to every thing about it. This may direct the farmer, as to the time of laying on his dung.

Although dung naturally renders a soil warmer, it may also make it colder. It has been observed, that whole fields of wheat have perished by frost on dung'd lands, when they have lived through the winter on those lands of the same soil, which have had no dung that year. This may have arisen from the hollowness of the ground in which water lay about the roots of the young corn, and then freezing, killed it : but more observations ought to be made before it is received as an universal fact.

Mr. Tull is the person who delivers this account, and his

his prejudice against dung might carry him too far. He wrote to establish the use of a particular kind of tillage in its stead, so that he may be considered as a prejudiced person. We are to read what is written by those who propose systems, with great allowances for partiality. Well supported facts may be believed whoever relates them, but men are often blinded by their prejudices, when they argue from single experiments of their own. The few who have meddled with this subject since Mr. Tull's book, all take up his violent prejudices against dung. They have considered him as an ingenious, but they should also have considered him as a prejudiced writer.

Some lands bear dung better than others; and certain soils require particular kinds; or a proportioned quantity. In this part of his business it is the farmer wants to be instructed, not as to the nature of dung itself, which he full well knows; and which I hope he will continue to esteem his own way, and as his fathers used to do, in spite of all the charge brought against him by partial writers. These, while they accuse him of ignorance, often know less than himself.

He is to esteem dung the most universal of all manures, and in order to use it to the fullest advantage, let him observe the cautions and directions that will be here laid before him. All the accidents those writers lay to the charge of that manure, are owing to a wrong choice of the kind, to a wrong proportion of it to the land, or a wrong management of it.

Dung often does mischief, but it is in unskilful hands: to rail at dung as always hurtful, were to fly in the face of all authority, and all fact; and to reason against experience,

This has lately been done by too many, but they are all blameable; they have done it in favour of some other method: this is to write partially. We have given a full account of many, and shall of all the other manures; and the same of every kind of tillage; but doing them justice, let us be just also to this.

All soils do not equally require, nor will equally bear dung. If the effect of dung be to divide and warm the soil, it is not needful on those which are hot and loose already, dung is therefore not so useful on sandy as on clayey lands.

All times are not proper for the laying it on, nor is every condition

condition of this manure proper for every occasion. If dung be left, when rotten, upon the surface of the ground, the sun and rains will exhaust all its virtue: and if it be buried too fresh, and in too large a quantity in rich soils, it will occasion weeds,

From this have arisen the complaints against dung. But as that manure is highly useful, we shall shew the occasions of those accidents which sometimes attend it; and point out to the farmer, the soils to which the several kinds of dung are fitted; the manner of preserving, and the seasons of applying them: teaching him how to prepare his manure for his soil, that he may reap its benefit, and escape these misfortunes.

C H A P. XXII.

Of horse dung.

HORSE dung may be divided into several kinds. The differences between the dung of various animals, depend principally upon the food on which those creatures live: the dung of such as feed only on flesh being of one kind, that of those which feed on herbage only, of another, and that of those creatures which eat both kinds, being of a middle nature between the two.

Though horses feed altogether on vegetable products, there is a great deal of difference between the green and moist grass they eat on pastures, and the dry hay in the stable. The corn also is another great article in the making of this dung: but this is not all the difference. If we spoke only of the dung pure, and as it is voided, there must be these variations; but we generally mean by horse dung, that which is mixed with the straw or litter; and we are also to consider it as it may accidentally have other additions.

For perfect knowledge of this manure, we are to consider it in three conditions. 1. As picked up pure and entire; 2. As taken out of stables, and 3. As swept and shovelled up from the roads; which last, though not a common, is an excellent practice. In these three states we find the dung 1. Pure, 2. Mixed with straw and urine, or 3. Mixed with urine and dust.

These circumstances make a vast difference; but a great deal more is also made by the time when the dung is used,

used, whether fresh, or after it has been drop'd, or lain mixed some time.

Pure dung is moderately warm; dung from the stable, when it has got into a ferment with the straw and urine, is hottest of all; and the dry dung of roads, though it has little heat, has a great deal of fertility.

There is a vast difference between the dung of the stable, when it is in a state of fermentation, and when it has gone through that, and is well rotted. In the first condition it is often too rank, and less than the usual quantity should be allowed when it is taken at that time; but when mellow, it has sufficient fertility. Of all these accidents and considerations, we hope to give the means of judging fully: and we are assured that when the several conditions of this manure are better understood, there will be few complaints of its ill qualities.

Physicians when they order horse dung as a medicine, direct that of stone horses to be used. The farmer will have the same reason for giving the like preference in his use of it.

It is not only that stone horses are usually more vigorous and spirited than mares or geldings, but in general there is a difference in the feeding; the stone horse being commonly kept to dry meat in stables.

The dung of an animal consists of the grosser parts of its food, mixed with the juices of the mouth, and stomach, and with the gall. It is a mixture of vegetable matter, and animal juice, and the stronger and heartier the food, the better and richer will be the dung.

The richest horse dung is that of stable-kept horses, well fed with hay and corn: and this gets great additional richness from the urine, which in a well-contrived stable mixes among it. The stable should be paved, that the moisture may not soak into the ground, but mix with the dung and litter.

Every thing in the nature and effects of dung, agrees with and supports this account. The dung of cows is colder than that of horses, because cows in general feed on grass: that of horses is warmer because of their hay and corn: and the dung of fowls is the warmest of all, because they feed in a manner on corn only.

For this reason horse dung is fittest for cold lands, and cow dung for hot.

The dung of our own species is by some highly extolled,

led, and doubtless it exceeds all others in strength and richness, because of the flesh we eat : swine's dung is also extremely rich, because of the animal part of their food ; they eating partly one kind, and partly another, as it is offered to them.

Notwithstanding it has been a fashion of late to rail at horse dung, all own it has great effects. The old writers attribute the fertility it gives to lands, to its being of a nature fit to attract the nitre of the air : Mr. Tull gives it altogether to its fermentation, which breaks and divides the ground : and this fermentation he says is owing to the salts with which it abounds.

Mr. Tull's seems the plainest account ; but perhaps there is truth in both. Whatever be the secret cause of the operation of dung in making land fruitful, it is plain from all accounts, as well as from experience, that it has this effect ; and it will become the farmer to know exactly in what manner to regulate it to his occasions.

Horse dung may be too poor from its having too much litter among it ; and from its having lain exposed too long to the sun and air. In this case a great quantity is required to answer any purpose ; and the best way is not to use it alone ; but to mix it with other dung, by which it may get into a new fermentation.

It may on the other hand be too rich, as when the litter is well proportioned, the urine all soaked into it, and the fermentation high. In this case it will occasion weeds and insects, it should therefore be tempered with a proper quantity of earth, before it is spread. This at once encreases the quantity, and takes off its rankness.

From what I have seen, I prefer the mixing earths with dung upon every occasion, to the common method of laying the dung on alone.

But let the farmer take care to suit the earth he mixes with his dung, to the land on which it is to be laid. One soil may always be a manure to another. If it be a sandy soil on which dung is to be laid, a clayey earth is best to mix with it ; and if it be a clayey soil, a sandy earth, and so of the rest. Thus he will at the same time by mixing earth with his dung, encrease the quantity, take off the rankness, and give a double dressing to the land ; the earthy part of which will remain in great effects, after the dung has spent itself.

The common method is to mix wash, weeds, and many

my other things with his horse dung in the heap; and to add earth to sheep dung, by laying it under them in the hovel; but we are for extending the practice of mixing earths to both kinds, for I have found it as useful with one as with the other.

Dung in itself is too rich for any soil, and I have found by experience, that it will spread the profitable fermentation farther, by beginning with a little earth first. The earth that is already mixed with the dung, gets into a state of fermentation before it is laid upon the ground; and as soon as it is plowed in, that works upon the rest.

A great deal is to be considered in the keeping and preparing, as well as applying of horse dung. As to the three kinds already distinguished, the farmer will find the most frequent use for the stable dung, or that mixed with litter or urine. The use of entire horse dung must be on grounds that require but moderate heating, and the road dung is to be used where fertility is wanting, and not heat.

C H A P. XXIII.

Of horse dung used singly.

THE use of pure horse dung is in a manner confined to pasture grounds; and that of the roads to corn lands of a clayey soil. On these heads I have some things to add from my own practice.

I one year made my man take up all the dung the horses drop'd as they went along near the house, and lay it up in a place under cover. When a large heap was collected, I had it crumbled to pieces, and strewed thin over my meadow and pasture grounds, in the fair hours of a dripping spring; the rain washed it in, and the encrease and richness of the grass was surprizing.

I next strew'd a large quantity of it over a field of corn, in the manner the farmers call sowing of dung, and as they use pigeons dung in many places: but this did not at all answer my expectations. Its light and dry nature, where it lay exposed upon a naked field, made it lose all its virtue without entering the soil. I set down both these trials, that the farmer may know what it will not do, as well as what it will.

Horse dung taken from roads, I have also experienced two ways. I have a field not far from a place in the
great

great road, where horses stand to stale, and they drop their dung often in the same place. I have got the shovellings of this part of the highway for my field two ways; and the one it was prejudicial, the other very advantageous.

First I had it taken up at a dry time, when it was almost all like dust. This tasted salish, and I could perceive it was a gritty powder, with a great deal of dry dung among it, and some remain of the urine. The land I laid it on was a cold clayey soil, and it answered in great perfection. The grit breaking the clay, at the same time that the remains of the dung, and the salt of the urine, warmed and enriched it. Another time I had it taken up when it was reddish coloured, and as soft as pudding. It was spread directly over my land, which was plowed in upon it, and rains coming on, the whole virtue was kept in, and washed into the soil: but this did great harm to my crop, being too strong of the urine. Many things assist the growth of plants in a moderate way, which will destroy them in too great a quantity. From that time I have kept to the use of the road dung tolerably dry, and have always found great advantage from it. And I have kept my heaps of pure dung for my pasture, moistened by having the chamber pots emptied upon them; and have found this answer to my own great satisfaction, and the surprise of all the neighbours.

CHAP. XXIV.

Of horse dung made into compost.

HORSE dung is commonly mix'd with litter and urine: and the more ingredients there are for this purpose the better. The antient writers have laid down a plan for improving horse dung in this manner, which the latest have prudently copied from them.

The benefit of dung in the usual way, is not owing to the richness of the excrement of the horse alone, but to its state of fermentation with straw and urine. This fermentation, and this richness, may be both encreased: nor is there any article in the farmer's practice more necessary to be thoroughly consider'd.

The virtue of dung may be improved, and preserved. It will be improved by mixing with it all kinds of things that have an animal tincture; or vegetable matter that will
rot

rot with it; or that contain any salt; and it will be preserv'd by keeping it cover'd.

Markham advises the farmer to pour continually upon his heap of dung, all his beef broth, brine, soap suds, and the like; by which means, one load will be worth five; and in general these writers condemn with justice, the naked and exposed manner wherein the dung is kept; by which means the best part of its virtue is lost before it is carried to the ground.

On these principles the farmer will follow the advice to keep his dung cover'd, and add to it every thing he can, which will give new virtue, as well as encrease the quantity. We hope to shew him how to use dung to many times the common advantage; and to avoid all the mischiefs that happen from its improper use.

Let him dig a pit of depth and bigness proportion'd to his quantity of dung. This must be well paved, and wrought up the sides, that no moisture can get through, and arched over at the top to keep all close; with a door for taking out and throwing in the dung. The draining of the stable and cow-house should run into this pit, and into it all the dung and litter from the stables is to be thrown; and the bottom of the stables and cow-houses should be paved hard, that the urine may not soak in, but run through the proper channels into the pit. If the chamber pots be daily empty'd into it, the better.

Beside the horse dung, all the cow dung, hog dung, and that of all other kinds, if not wanted alone, is to be thrown into this pit; with all the refuse of the garden, cabbage stalks, and the like; and the ashes from the kitchen; the earth cut up in cleaning of ditches, and the like: and into it should be also emptied, the wash, soap suds, and all other refuse. The whole is to be kept of such a degree of moistness, as to assist in the fermentation, and no more. The whole spirit of the several materials will be thus kept in, and the mixture will be mellow'd in a most beneficial manner.

Markham, who laid the plan of mixing these matters with dung, says, one load of such will be equal to five; later writers say, one will be equal to twenty, but the farmer must not depend too much upon these large promises.

There may be also an addition to this, which will be of more worth than all. When he has got his quantity of dung thus rotted and mellowed, let him throw in at least three

three times its quantity of earth. Thus the whole is made four times what it was, and every load will be as good as a load of the entire mixture. Let him not spare the expence or trouble of mixing the earth well with the rest : when that is done, let it lie together about a week, in which time it will ferment and mellow, and it will then be fit to lay upon his land to the greatest possible advantage.

I will not say this compost is not subject to breed worms, for all rich and mellow soils have them ; but it will breed fewer weeds than any.

CHAP. XXV.

Of the laying on of dung.

WHATEVER kind of dung is used, there is a great deal of benefit, from the right time and manner of laying it on the ground. Some, beside exposing it to the weather in the heap, let it lie spread upon their lands a month or two before it is plow'd in : but this is a great error. The sun and air thus exhaust almost all its virtue, before it gets into the ground ; so that a large quantity has little effect.

Others lay it on in little heaps, and let it remain some time before they spread it. This is not so weak a practice as the other ; but it is throwing away the best part of the virtue.

For land that has three plowings for a corn crop, the right time of laying on the dung is just before the second plowing : and let it be carried from the pit after six or eight days mellowing with the earth ; spread as soon as it is laid on ; and plowed in as soon as it is spread. This preserves all its virtue ; and when manag'd thus, it is amazing to see what effect it takes upon the soil.

When it is for pasture grounds, another method is required. To the dung and earth add an equal quantity of river mud ; and let a heap of this be cover'd with fresh turf, that it may sweat and mellow together. When this is thoroughly mix'd and short, it is to be spread thin on the grounds before rain, and thus it will all dissolve, and be carried in to the soil, in such a manner, that only a few straws shall remain.

These are the best rules for the management of horse dung,

dung, whether used of itself, or made into compost : but general rules cannot suit all particulars ; unless proper cautions be added.

If the farmer who uses horse dung in the common way, fears weeds ; let him lay it on his ground when a little cooled. If he want its utmost warmth and strength, let him use it fresh, and in all its vigour ; and in this manner his own prudence will advise him on other occasions, remembering the general directions.

When dung is used upon a summer's fallow, the proper time is just before the twy fallow, spreading it before the plowing, that it may be cover'd in, and be buried to mellow the ground about it till the next plowing, when it will be raised again, and mix'd by this care in a due proportion. The greatest misfortune in the use of dung is, that it affects only a part of the soil ; but this practice is a remedy, twice the quantity at least of the land falling under its influence, in this method of using it.

CH A P. XXVI.

Of the virtue and quantity of horse dung.

WHEN the farmer who has been used to fill his field with weeds by dunging it, lets that manure lie till rotten before he lays it on, he avoids that mischief : but at the same time he loses a great part of the virtue. But the land that is so ready to be over-run with weeds is rich, and therefore requires less assistance. Thus the considerate man is to take a view of the whole matter before he judges finally.

There is another fault in dung which farmers are less aware of, though it happens in the same kind of lands. When dung is improperly laid on a rich soil, it not only promotes the growth of weeds, but it makes the corn rank in the stalk, and thin in the ear. Nothing is so easy as to do mischief : but in this case mellow dung, used in moderation, is the right practice. He should never lay dung on this kind of land till it is rotted to mould, and then not more than fifteen load on the acre.

For this reason old, mellow, and rotten dung is so often recommended. It is more required than fresh, on many lands. And for want of this knowledge, the farmer who follows the practice of his neighbours, without regarding

his soil, injures his land by the great expence of dunging it improperly. Then knowing no other method, he has recourse to dung again, and so ruins it entirely.

The expence of dung is great; and the farmer often makes it greater than it need be. He thinks if dung be right, the more of it the better: but this is a medicine that kills in an over dose. Neither is there any good in encreasing it, even when it does not amount to a mischievous quantity; for three crops will exhaust the virtue of any quantity of dung whatsoever. Twenty load to an acre is the full proportion that ever need be allowed.

There is no grain with which fresh dung so well agrees as barley, it is so natural to this that it does better pure than with any mixture, and it does best of all upon an etch crop. In the succeeding fallow the dung will be perfectly mix'd with the soil, and will have time to ferment with it. After this the land will be fitter for wheat than by any other management.

C H A P. XXVII.

Of cow dung.

AS horse dung is the best manure for cold lands, cow dung is the proper dressing for hot soils: not but that all dungs are, according to the sense of the word, hot; only the degree is different. They all act upon the soil, by fermenting with it; and these fermentations are always attended with heat. The chemists mention fermentations attended with cold; but none of the farmers are of that nature.

We have explained the occasion of heat and coldness in the effect of dung: as the highest fed horses afford the richest and warmest from their dry food and corn; cow dung is cold in proportion, because the creature feeds upon green pasturage.

Under the article cow dung we include that of the ox, and others of the same species.

The best use that can be made of this dung is, the mixing it into a compost with the horse dung and other refuse. And though it has less effect than almost any other kind when used singly, nothing enriches a mixture more.

We know dung which has lain together till it is mellow and rotted, is better than such as is fresh. This gives a more slow but more general fermentation to the soil; and at the same

same time that it feeds the corn in the ear, it keeps down its rankness in the stalk.

There are soils which do this naturally; and others may be made to do the same by art. There are some lands on which barley has an ear almost as long as the stalk; and we may give the same virtue to others.

This the farmer is to do by manuring a tolerably warm soil with rotten compost; and the best ingredient in this is cow or ox dung. I make up an heap, proportioned to the bigness of the field, of horse dung, cow dung, and river mud; laying them in layers one over another; a layer of horse dung; then of mud, then of cow dung, then a layer of mud, and then of horse dung again, and so on. This heap I cover with fresh cut turf, and leave all to mellow and rot together. When they are thoroughly rotted I mix the whole by frequent turning, and then spread it over the land just before plowing, that it may be cover'd in, and yield all its richness.

I have met with very few who know the real value of cow dung. It has not the sudden effect that horse dung has, because it does not ferment so briskly: and therefore it has been suspected of having much less than it really possesses. What virtue it has also very freely evaporates, and is lost if it be used without due care. This method is, perhaps, the only one whereby its full virtue can be given to land.

C H A P. XXVIII.

Of sheeps dung.

THIS is one of the most valuable articles in the class of manures; and is, for many purposes, better than any other whatsoever. It has not that violent heat which is in horse dung, from the high feeding of the creature; but there is a richness in it that exceeds every thing.

Sheeps dung is not to be managed as horse dung, because of the smallness; but the farmers have two ways of using it, according to the different occasions. The one is folding the sheep upon the land; the other saving the dung, together with the urine, under a cover'd fold. The former is the more ready and the more common method, but the latter is the most advantageous: and is what many have laboured very wisely to encourage.

Beside the use that is made of sheeps dung these two ways,

a great deal is lost. When sheep are fed on downs they drop their dung about, and it does little service to that soil. The wise husbandman may have great quantities of this pick'd up, at little charge; and he will find it much more valuable than ordinary dung.

The method of folding sheep upon lands is well known, and when there is a good flock, well managed this way, the advantage is very great. But care should be taken that their dung be not left exposed to the air and sun, upon the surface of the ground, for that will exhaust its richness with no value to the land. It should be plowed in as soon as possible: for it is, of all dungs, the most free to lose its virtue: such earth as is plowed up immediately after the fold, while the dung is fresh, and the earth moist with the urine, will have ten times the benefit of that where the folly and carelessness of the farmer leaves it any time exposed.

The richness of this manure depends, in a great measure, upon the mixture of the sheeps urine with the dung: this is evaporated presently by the sun, if the earth be not plowed up to mix and bury such part as is moistened by it: and in hot seasons the dung itself will, on a little exposure to the sun, be rendered dry, and of small value.

Dungs, in general, suit all soils; but a cold clay receives most benefit from the folding of sheep. When the dung is saved in the cover'd fold, of which I shall next treat, the mixture being what the farmer pleases, he may, at his discretion, suit it to all lands.

This method by the cover'd fold is familiar, cheap, and easy: it yields a vast quantity of manure; and the farmer suits this to his purposes: the advantage therefore is universal.

We first learned it from Flanders, where it is still practised to great advantage.

Blith recommends sand to be used for receiving the dung and urine of sheep in the cover'd fold; and others have mentioned particular kinds of earth: any kind will receive the enrichment; and therefore the farmer is to suit the whole to the purpose for which he wants it, using sand, poor earth, loam, or whatsoever else will best agree with the land where on it is to be laid.

The manner of doing it is this. Let a large sheep house be built of a long square shape, boarded at the sides, thatch'd at the top, and open at one end. Let there be cribs all round it, for sothering the sheep when necessary; and a large crib



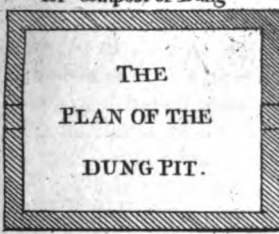
B Drain from the Cow-house

Section of the Pit
for Compost of Dung

A Drain from the Stable



Section of a Lime kiln



Falling of Chalk



The Cover'd Fold for Sheep.
Compleat Body of Husbandry.

in the middle. Let the floor of this sheep house be cover'd a foot and a half deep, with a sandy, loamy, or other earth; and let the sheep stand to feed, and lie on it.

At a week's end let a fresh quantity of earth be brought in: and the dung the sheep have made, cover'd with it: and let this be repeated every week; each covering of new earth being spread to the depth of three or four inches. The sheep will thus lie higher and higher every week, and all the earth that thus makes the floor of the sheep house, will be mellowed and enriched with their dung, urine, and the fatness and perspiration of their bodies; the whole will thus be one of the richest manures the farmer can possibly procure.

A part of it may be taken away from time to time, as it is wanted, and fresh earth laid in its place, so that there will be a continual supply.

This method may be used for keeping sheep in winter, that are folded open on the lands in summer: and those that are kept on the downs may be housed at nights all the year round, in the same manner. The quantity of manure thus made is very great; and the expence is almost nothing. We are to add also this farther consideration, that as sandy soils are a manure for those which are clayey, and so of the rest, the farmer will all the while that he is enriching them with dung, be breaking or giving them a body, or altering them in whatever other necessary way their kind requires; and this part of the dressing will never be so well mixed with those lands any other way. A course of years manuring the worst soil, in this manner, will thoroughly alter its nature, so that it never can relapse into its original barrenness again, and the farmer will be gathering great crops all the while.

Barren downs may be, in time, brought to good land, by the continuance of such a practice: and it is no unreasonable expectation that a late author forms, of seeing such an improvement take place, if the people concern'd can be prevail'd with to have these cover'd folds on their sheep walks, and to take the manure as it rises, for the improvement of enclosed pieces of the land.

C H A P. XXIX.

Of hogs dung.

HOGS dung has been condemned by antient writers ; and they have been follow'd in their censure by some among the later ; as unfit for corn lands : but the nature of that censure shews that the manure deserved praise. The fault was, that it produced weeds. Whatever forwards the growth of one plant, will promote that of another.

The fact is, hogs dung is a very rich manure. Any good dressing will forward the growth of weeds, if it be given in too large a quantity. Hogs dung, as the excrement of a creature that feeds partly on animal, and partly on vegetable food, is richer than that of any creature which feeds on vegetables only. This richness was understood by the antients as a fault. One load of hogs dung will go as far as two of the best horse dung. The earlier farmers who did not know this, laid it on in the same quantity they did the other, and then condemned it for the effects of its richness.

Any dung forwards the growth of weeds when laid too thick ; and they always laid this so, because they did not know its virtue.

A mixture of hogs dung and urine heightens the virtue of common dung extremely : and this is a good way of using it : for corn lands no way is better : for it does not mellow so well in the earth, when laid in a heap, as horse dung does ; and it is so rich, there is no spreading it thin enough singly.

Though it cannot be conveniently used alone for corn lands, there are other purposes which it serves in its entire state : particularly one by which it prepares ground for corn better than any other method.

Hogs dung used alone, is excellent on meadow and pasture ground, producing a large, and at the same time a sweet blade.

It is also preferable to any other dung for trees. It has been said of old, pigeons dung was best for the culture of fig trees ; but I have try'd it with hogs dung in a fair comparison : pigeons dung is useful for other trees as well as the fig ; but the hogs dung is preferable to it both for that, and all other kinds.

No dung yields its virtue so readily as this ; but none loses
it

it so quickly by improper management. The time of laying it on should be carefully regarded ; for a gentle rain coming after, will entirely wash it into the ground in a few hours ; and, on the other hand, a dry windy day will carry away all its efficacy, and the land will be no better than if sprinkled with chaff.

The farmer who uses hogs dung on corn lands, must not spread it in a dry season ; nor lay on too much. It is best to make it up with other matters in this manner.

Let the hogstyes be well paved, that nothing can soak into the ground, but the dung and urine together may mix with whatever is thrown in. Then let the refuse of the garden, bean stalks, pease and bean cods, dead plants, and all other waste matter, be thrown in, and stir'd about from time to time, that the dung and urine may thoroughly mix with them.

The hogs will be pleas'd with this ; and it will raise a quantity of dung many times as great as naturally would be had from the same number of swine. This is to be cleared away and used as there is occasion, throwing in fresh matter afterwards.

In some parts of Kent they imitate the custom of close folding sheep, in the management of their hogs. They lay the bottom of the sty deep with chalk ; and after that has received the dung and urine for some time, they dig it up and dress their lands with it to great benefit.

Earth, sand, and other materials, may be in the same manner laid at the bottom of the styes, and dug out once in ten days or a fortnight ; and the styes again supply'd with fresh. This will be vastly enrich'd by the dung, urine, and perspiration of the creatures, and will make an excellent dressing for lands.

In Staffordshire they understand the value of hogs dung so well, that they will sow lands purposely to feed them. There is a particular kind of pea they keep for this service. It is a small white kind. They sow the poorest lands with this for hogs, turning them in to fatten ; and letting them lie day and night upon the ground. By this they have a sufficient advantage from the swine ; and at the same time the land is so enrich'd, that it will yield a good grass many years.

This gave the hint to a late author for sowing clover for hogs. He proposes keeping a proper number of sows that are ready to farrow, in styes made in the corners, and along the hedges of a young clover field. They are to be fed with

boil'd turnips at first, and afterwards with raw ones, rais'd for that purpose, till they have farrow'd, and the clover is of a height to feed them. They are then to be turn'd loose, and they will thrive he says in a surprizing manner, grazing without rooting up the ground.

This practice, the author affirms, may be followed upon the same land for three years with great profit; and at the end of that time the ground will be so enrich'd by their dung and urine, that it will yield vast crops of corn without any other dressing. This is strongly recommended, but we have not seen it try'd, it rests upon the faith of the person who proposed it.

CHAPTER XXX.

Of pigeons dung.

THIS is a dung celebrated by all writers, and valued by all husbandmen with great reason. 'Tis a misfortune that it cannot be had in large quantities. Swines dung is better for trees, for the dung of pigeons is too hot for that particular purpose. But this, which is a fault on that one occasion, is a great merit on others.

The particular heat which it has beyond all other dungs, makes it superior to them all on cold clayey soils: on which it promotes the fullness of the ear in barley and wheat in a surprizing manner, while the stalk and blade of the corn are not seemingly encreased by it. I have seen a field on which the farmer ventured to bestow a large dressing of pigeons dung, where the barley seem'd half ear. The stalk was short, firm and stubby, and the blades small and trifling, but the head surprizing.

It is a dear manure where the farmer is to buy it; but as a little goes a great way, it will bear carriage better than other kinds, when he cannot get his dressings on the spot.

In Hertfordshire they will give ten pence a bushel for it by the waggon load, and send fifteen or twenty miles for it into the neighbouring county of Bedfordshire; and notwithstanding this great price, it answers extreamly well.

Forty bushels of pigeons dung will be sufficient for an acre, but there is to be a great deal of care taken in laying it on. The best way is to sprinkle it at top of the ground immediately after the barley is sown, for this is the corn it favours most of all. The first rains wash it entirely into the ground;

and

and the corn as it swells and softens for shooting, takes it up almost wholly, and has the advantage of its warmth from the beginning.

Sprinkled in the same manner upon the land just after the sowing of wheat, it has also an excellent effect. They call this manner of spreading, sowing the dung; it is to be harrow'd in with the seed, and its effect begins immediately with the shoot. This continues visibly during the whole growth, to ripeness; for no corn swells in the ear like that which has had a dressing of pigeons dung. But this is all. Its whole virtue is exhausted by one crop, so that in this respect it falls short of horse dung, and the common composts, which enrich the earth very well for three.

Pigeons dung is excellent on moist as well as tough soils. The farmer depends on the effect of its warmth, which answers equally on these two occasions; but it is more frequently used on the black clays than any other land.

When temper'd with other dung, it is excellent for trees: and alone it is superior to all other manures for a hop ground. It enlarges the hop upon the plant just in the same manner as it does the ear upon the corn, and gives it a particular strength and spirit.

As the value of pigeons dung is so great, it is adviseable for the farmer to have a pigeon-house wherever it can be done with conveniency. I have found by experience, pigeons dung may be encreased in quantity in the same manner as some other kinds; and this without impairing its virtue, provided it be done with moderation.

I have cover'd the bottom of my pigeon-house four inches with a fine mellow black mould well ground to powder; and this when it has been taken out, mix'd with the dung and feathers from the pigeons, and the sweepings of the walls, has been a manure of prodigious virtue.

There are many reasons for the farmer's having a dove-coat; but this of their dung, when rightly manag'd, is not the least considerable.

C H A P. XXXI.

Of the dung of poultry.

THE dung of hens, turkeys, geese, and whatever other fowls the farmer keeps about his yard, are also useful. If we were to give heed to idle traditions on this head; each

each of these kinds of dung would demand a particular chapter, for they are said to be of different natures: that of the goose being a poison to grass, and the dung of the peacock burning up corn.

A better system is at this time established: experience has given the lie to tradition, in these and several other articles; and we find by trial, that the dung of all these kinds of poultry is nearly the same, and all very rich.

We propose mixing pigeons dung with earth in a small quantity, and we shall for a double reason recommend the same practice with that of poultry in general; and particularly with hens dung. This is as rich as the pigeons, and therefore will bear a small mixture of earth as well; and it is in its nature so tough and clammy, that it cannot be spread alone upon the land so regularly as the pigeons dung is.

My custom has been, to have the dung of hens stir'd up with an equal quantity of rich mould, which divides and breaks it so well, that it will freely spread like the other, in the way of sprinkling or sowing.

It gives its virtue better this way than when used alone. For the little quantity of earth that is mix'd with it, being in a condition of fermenting, spreads the effect freely through the land; and ferments the whole, not only more speedily, but more perfectly than when the dung is used alone.

This is the most profitable use of hens dung, and when thus scatter'd upon corn lands, just after the sowing, it answers the purpose of pigeons dung, where that cannot be had.

Some farmers, to break the clamminess of hens dung, mix it with pit sand, or ashes, and then spread it on the land. This is a practice recommended in books; but the mixing it with mould is much better: for it ferments with the mould, which it will not do with the ashes at all, and very little with the sand.

Hens dung is excellent for pasture and meadow grounds, as well as corn lands. The best way is this of breaking its clamminess with earth, and sprinkling it on: but the earth I use, on this occasion, is a particular kind.

I take the bottom of some old hay-stack for this purpose; the soil is always mellowed by being so long cover'd with the hay, and a great quantity of the seeds are sure to be mix'd among it. This is the earth I use with hens dung for pasture ground, and I give it in a double quantity.

This mixture spread properly in spring, makes the ground yield

yield a growth beyond any thing else. The bottoms of haystacks alone are of value for this purpose : but they are not to be compared to this mixture with hens dung.

Hens dung on corn lands, does most good upon a clayey soil : but it may be used on any,

Bad consequences have sometimes arisen from it, when it has been used without consideration ; and hence it has fallen into disrepute : but every thing that can do good, may, in a foolish hand, do harm. Some ignorant farmer, taking the dung from his hen-house, and scattering it irregularly on a burning soil, has parched up his crop : but if he had first mixed it with earth, and then bestowed it regularly ; there is no soil on which it would not have done service, though more on some than on others.

Hens dung is also excellent for trees. We often see those trees on which these fowls roost exceed all the others of the same kind and standing, in the strength and bigness of their shoots. Mr. Worlidge gives an account, from his own knowledge, of a quince-tree on which the hens roosted, which, from the virtue of their dung, bore an incredible quantity of fruit.

Peacocks and turkeys dung is of the same nature and virtue. These several kinds should be all gathered up together and mixed with mould : they will thus make a quantity greater than might be supposed, till try'd ; and will be of great value.

The dung of geese, ducks, and other water fowls, differs in some degree from that of the land kinds. The dung of ducks is particularly rich, but neither that nor the geese are so hot as the pigeons. I speak from my own experience.

The dung of geese is vulgarly supposed to be a cause of barrenness, but on the contrary, it is rich in the highest degree. It is excellent on corn lands, and may be laid on any soil.

As it is difficult to spread this thin enough it may be mix'd like the others with mould, with which it will ferment, and mellow. After this it will be all wash'd into the earth, mould and all, and will stir up a general soft ferment, which breaks the soil.

I have examined strictly, and I think all the effects of dung may be referred to the effect of its fermentation ; in dividing and in heating the ground. Violent and hasty fermentations occasioned by the dung of these fowls used alone, and other such materials, soon goes off ; and the earth which was

was made hollow by it falls close again, before the crop is half grown; whereas, when they are thus mix'd with earth, and the fermentation comes on more gradually, it lasts the longer. I name this opinion from what I have seen in the effect of goose dung mix'd with mould; and I am confident the warmth and hollowness of the ground, occasioned by this manure, has lasted in a barley field from the time it was lain on, which is just after the sowing, to the very ripening of the corn in the ear.

One caution let me give the farmer, with respect to his rolling these fields; which will hold good universally: that is, that he never do it in wet weather; it cakes and clods the soil, and it has prevented the whole effect of a goose dung dressing, which was never able to recover the land to hollowness.

Rolling in dry weather, at the same time that it smooths the ground, flattening the several small clods, bursts and breaks them: and it is now sufficiently known, that breaking the soil is of vast use in giving fertility. The best dung, with too little plowing, will answer little purpose; and the worst, with a great deal of turning, will produce crops not despicable.

The greatest difficulty attending goose dung is the getting it together, and spreading it on the land. I would propose the same method with the geese as with his sheep, keeping them upon the land.

Let him turn his geese upon a wheat field in winter, and suffer them to lie upon it till they have eaten it off close to the ground, which they will readily enough do, being fond of the young blade. They will leave their dung very plentifully, and well enough spread upon the land, the frosts and rains will sufficiently break and wash it in; and the wheat will rise, in spring, not at all the worse for the cropping, and the earth will be so enriched by that excellent manure, that the ear must shew the advantage.

I never try'd this. It is proposed therefore, only as a thing worth trying, because the hope of success is founded on reason. There are many accounts related of accidental advantages obtain'd from the same cause, which are sufficient to lead a considerate person to the attempt.

The old notion that goose dung was destructive to grass, has been found, by experience, utterly false and groundless. On the contrary, wherever goose dung is drop'd in
3 to-

a tolerable quantity, on a pasture ground that has any natural heart, the grass rises finer, richer, and sweeter than it does from the use of any other manure whatsoever.

Goose dung is as good for pasture as for corn lands; and if the farmer have convenience of dressing them with it mix'd with the bottom of an old hay-stack, there is no manure in the world that will yield him a fairer or fuller growth.

We see in other countries, as well as our own, where vast numbers of water fowl come in the breeding time, that their dung is so far from hurting grass, or from making it injurious to the cattle that feed on it, that nothing produces so rich, or so wholesome pasturage.

Upon the coast of Norway there are several islands, where water fowl settle in such vast flocks, at the breeding time, that the surface of the ground is cover'd with them. Their eggs, and their feathers, are a merchandize for the people of the neighbourhood; but this is not all they get by their visits. As soon as they are gone, the earth that had been cover'd with their dung begins to shoot up a sward, that is not equal'd any where in the world; and they send in cattle to feed upon it, which though carrion when put there, are in a little time fatten'd.

Some of the Scotch islands are yearly visited in the same manner, by flocks of these birds that come to breed there; and the same effect follows, where there is any depth of soil. But we are not so ready to take advantage of the benefits of nature as our neighbours. On some of the like places on Lancashire, they have the discretion to feed cattle, after they are covered with this rich sward from the dung of the fowl; and they find so much profit from it, that it is a wonder the practice does not extend farther.

C H A P. XXXIII.

Of human excrement.

THE using the excrements of our own species for dressing of lands, is in a manner putting them again down our mouths: but this particular kind of dung, is not without its efficacy; nor must we close an account of manures, without saying something of it. There will be no harm in the farmers understanding its nature, as to the using or not using it, that must depend upon his choice.

The

The excrements of animals are rich, consider'd as manure, according to the nature of their food. The higher fed they are upon the vegetable kinds, the better; and the dung of flesh-eating animals is richest of all.

The excrements of our own species must therefore be very rich, as our food is, in great part, of the animal kind: there is also another reason, which is, our drinking fermented liquors, which never fail to have their effect afterwards in the fermenting whatsoever they chance to be mix'd with.

The dung and urine of all animals is best mix'd together for manure, and the spirit that is in the human urine is well known to the curious. Chymists make a liquor from it that is as sharp as spirit of hartshorn.

The famous burning substance phosphorus, is also made from human urine; and the practice of those who have succeeded best in making it, shews that the addition of excrement to the urine helps the effect.

This may shew what vast spirit and warmth there is in human dung. As to its use, as there is something so distasteful, not to say shocking, in the thought, and as we have every where manures enough, of one kind or other, without it, 'tis more decent and better to let it alone. However, it has been and is used in some parts of England; and in many places abroad oftener than is thought.

This is a practice every where carry'd on clandestinely, for nobody would care to buy that farmer's corn, who should be known to use it: but there are those in several of our southern counties, who, if they thought proper to tell tales, could say a great deal of the profits rising from this manure.

In Flanders it is regularly sold, and laid on corn lands; and 'tis well known they use it freely in the vineyards of Languedoc. The custom is to spread it, for a time, upon a bed of mould, and let it be exposed to the sun; thus it loses a great deal of the ill smell, and of its hot quality; and it is then mixed with a larger quantity of mould, and spread on the land.

People are cautious of talking; but so far as can be collected this is the practice. Perhaps if it were let into the common mixture of the dung compost, it might add to its virtue: but 'tis not needful there, nor, finally, with us, on any occasion.

The writers on husbandry advise the farmer who employs this manure, to mix straw with it in the manner of litter:
but

but those who have try'd this declare, that it does not succeed as is pretended. The fermentation rising from the mixture of straw, with the dung of the horse, is very sudden and very great, but the same does not follow on mixing it with the humah excrement.

Though a rich manure, it is a filthy one ; and it is the least manageable of any whatsoever, and, of all others, the most offensive to the servants employ'd in spreading it, as well as the thoughts of those who are to feed upon the corn.

CHAP. XXXIII.

Of urine.

URINE has been named in the last preceding chapters, together with the several kinds of dung ; with which it is always mix'd by the prudent farmer ; and which it assists greatly in its office. We shall now mention its effects singly ; and the more, because they are generally misunderstood.

The urine of our own species, as well as of cattle, turns any plant brown upon which it frequently falls ; and finally kills it. From this there grew an early prejudice against urine, as an enemy to the growth of plants ; and some of the antient husbandmen were, for that reason, as careful to keep it out of their dung, as we are to get it mix'd with it.

Many things which, in their natural state, or used alone, are destructive, yet, in a proper management, promote the growth of plants.

Lime is not a soil for plants, nay it may be made to kill any. Yet nothing gives fertility to many kinds of soil equally with this, when properly applied.

Salt prevents the growth of vegetables, if spread thick over the ground ; and will kill them as certainly as urine, if laid about their roots, or sprinkled over them frequently in a strong brine. The effect it takes is just the same with that of urine, making the leaves turn brown and fall off, and, at last, the whole plant perish. Yet we find salt, properly used, is a great promoter of the growth of plants ; and exactly the same is the case with urine. These things are too violent in their natural and naked condition, but, when soften'd by mixtures, they are excellent.

Urine has another advantage over many of the hot manures, that it is of itself, capable of fermentation ; and by this

this means becomes quite a different thing. The use of fermented urine is not enough known in England. In Holland they have found it; and they know it to be one of the richest manures in the world. They are very careful there of the urine of their cattle, which they sometimes let run among the dung, to assist its fermentation, and sometimes use singly.

Urine, in its natural condition, is not so fatal to plants as is commonly imagin'd. If it be repeatedly thrown upon them, it will, doubtless, kill them; but experience shews, that after it has made them brown or yellow, if no more be thrown on, they will not only recover, but grow much finer than before.

Dung will destroy plants, as well as urine, if it be pil'd up about them in the time of its fermentation; and it will hurt the growth on many soils, if laid on in too great quantity: and urine, like dung, will promote their growth, when used with discretion and moderation.

It is better for corn land than pasture. Its use in manuring soils for trees, is at present unknown, but there was a time when people were acquainted with it; and they assure us it is excellent for this purpose. The antient writers on country affairs, advise the frequent use of it; and they direct that it should be old, or long kept, so that it is plain they knew the difference between fresh urine, and such as had been fermented.

The instance mentioned before of a person procuring a vast crop, by dressing the ground with woollen rags soaked in urine, is a proof, at least, that urine, in a discreet and moderate use, is no enemy to vegetation: but in the eye of reason it declares yet more in its favour: for, probably, the effect was as much owing to the urine as the rags.

There has been also another particular mentioned, of the use of the cleansings of roads where horses stale. This, more than any thing, confirms the truth of what has been said: for it appears, that when these cleansings were quite wet, and the urine of the horses among them was fresh, rank, and in great abundance, it did mischief: but, when that matter was dry'd, and the fiery parts of the urine were evaporated, though its salts remained, it proved of excellent service, and occasioned a very happy growth.

C H A P. XXXIV.

Of rags.

THINGS which serve no other purposes, generally are useful to the farmer as manure. We have an instance of this in rags, which when too bad for the service of paper-making, usually fall to his share. And he has advantage even in their faults on other accounts; for the nastier they are, that is, the dirtier and the more rotten, the better they serve him for enriching his land.

The reason of this is plain, their nastiness arises from the perspiration of the bodies of those who have worn them; and all animal matters are good as manure: and the rotterer they are, the more readily they dissolve with the weather, and are wash'd into the ground.

The reason why linnen rags should be useful, is, in the nature of their composition; they are made of vegetable matter, and all such when it comes to decay, assists in the growth of other vegetables. This matter can never be in a more perfect state of decay than when it is rotting from rags; unless we should name old paper, which has been made of rags, and which would doubtless also prove an excellent manure if it could be had in sufficient quantity.

Linnen rags came into use upon this principle; and they were found to answer beyond all expectation, owing to the sweat of the persons who wore them.

These rotten linnen rags alone fall into the hands of the farmer; for the cleaner and better kind go to the paper-mills. They are such as have been worn by the poorest people, and consequently have been as fully as possible impregnated from their bodies.

This is a disgusting matter to consider, as a substance to furnish corn we are to eat: but the farmer finds his account in it. Whoever shall pass by those cellars in which rags are sorted for the use of the farmers, will perceive a smell from their doors worse than any other: it is so horrible, the wonder is, it does not breed a pestilence. But this is all a proof of the fruitfulness of the materials; for this smell arises from the same cause that will raise a ferment in the soil; and as to the stench itself, it is either lost in the air, or left behind by the fine vessels of the plant; never getting into the corn. This is certain, for Hertfordshire is the county

VOL. I.

M

where

where these filthy things are most us'd as manure, and no corn is sweeter.

After linnen rags had been known many years, woollen were thought of; and they are at this time used; but not univerfally. Of their effect when steep'd in urine, we have spoken already; but without that they are very rich. The linnen rags enrich land as they are of vegetable origin, and these woollen ones do it as they belong'd originally to an animal body, such things being known to be richer than vegetables, on this occasion.

In those places where they have got into the use of woollen rags, they buy the refuse of taylor's cuttings; and find them answer very well: but the proper woollen rags for the farmer's use are those bought of the ragmen in London; because they are rotten, and because they are full of animal matter from the perspiration of those people who have worn them.

Woollen rags of this sort, will be found upon trial, a richer manure than any thing of the kind: and they may be had cheap enough, being of less use in any respect than the others; and for that reason pick'd from them.

Rags are of the nature of the rich manures that suit all soils, but those on which they are found most beneficial, are the chalky and clayey. They warm, loosen, and enrich beyond most things, and none shew more speedy effects. London is the great market for them; but the farmers in the neighbouring counties often send for them thirty or forty miles, and find good account.

The way to use them is this: they are to be chop'd small, and sprinkled over the land just after the sowing of the corn, so that they may give it their virtue from the first shooting.

About five and twenty bushel is the quantity for an acre.

The farmers in other places use old rope, untwisting and chopping it fine, and then sprinkling it over the land. This is serviceable as it is the decay'd state of some vegetable matter; but it is inferior to rags, because of the virtue they have got in the wearing.

In Buckinghamshire, and the neighbouring counties, they use linnen and woollen rags on their binding soils in a larger way; not laying them on as a top dressing, but plowing them in as common manure. They chop them, for this; but not so small as for the other use, and sprinkle them by hand evenly over the ground, allowing a much larger quantity than in the other way: they plow them in about

Midsummer,

Midsummer, and leave them to enrich the land against the time of sowing wheat.

Ellis says, they have of late got this practice also into Hertfordshire, on chalk and chalky loams, allowing five hundred weight to an acre. This is a lasting advantage to the lands; but the other only serves the single crop over which it is sown.

The use of woollen rags seems to have begun in Oxfordshire, where at this time it is more general than any where else in the kingdom. The farmers buy at a set price the refuse of the taylors, and it has been a traffick in the days of their ancestors. The effects are plain, altho' not using the best kind of rags, they have them not in the greatest degree: and it is astonishing, that a manure so well known, and so beneficial in one county, should not ages ago have spread itself through every part of the kingdom.

BOOK II. PART II.

ARTIFICIAL MANURES.

CHAP. XXXV.

Of lime.

Its various materials, and the manner of making it.

THE use of lime in husbandry, is one of the great modern improvements in that science: and it is now so well understood, that there is reason to believe, it will soon be universal. As there is a great deal of difference between one kind of lime and another; and many niceties are to be observ'd in the use of it, nothing can be more needful than a regular account of its nature and effects. Lime is one of those things that are able to do great good; and in consequence also great harm. It would be well that every farmer in England were acquainted with the virtue of it, but it is necessary at the same time that he perfectly understand how it is to be used.

Lime is of several kinds; made from many different materials.

It may be made of lime-stone, marble, chalk, sea shells, and many other things; but the two principal kinds are

those of stone and chalk. These differ in their nature ; but we cannot say properly that either is best ; for they severally are fittest for different kinds of lands : the true knowledge the farmer should have of these kinds is, to what purpose each is suited.

Every husbandman should burn his own lime ; and for that purpose we shall give him easy rules for the choice of his materials. In some places he may find both lime-stone and chalk upon his ground : he should then make both sorts : but if only one of these materials can be had, he must make amends for that defect, by a more careful study of the way to use it.

The hardest chalk makes the best lime ; and this is for the farmer's advantage ; for the soft marly chalk is fit for his use in its natural condition.

Lime-stone is very common. It is of various colours, and degrees of hardness : instead of referring him to the skillful for choosing it for him, we shall give him an easy method of doing this for himself.

Let him take a small bottle of aqua fortis when he goes over his land to look after lime-stone, and pour a little of it upon every stone that looks fit for the purpose : it will hiss and bubble up when it falls on lime-stone ; but it will run off from all others like water. This he may depend upon as an infallible rule : every stone which makes aqua fortis bubble, is fit for lime ; and no stone but what does, will ever make lime freely, or fit for his use.

Having found what materials his land affords for this manure, let him build his kiln for it. This is best done by a square hole dug for that purpose in the ground, in some waste place that lies conveniently for the materials. The kiln is to be in shape like a funnel, wide at top and narrower all the way to the bottom. It must be firmly built, and lin'd on the inside with a wall of lime-stone.

Toward the bottom there is to be a hole to let out the ashes : and above this there must be an iron grate on which to lay the first parcel of the materials. Some supply the place of a grate by an arch-work of stone, the same with the lining of the kiln, but the grate is much the best method.

When the kiln is prepared, the farmer is to get together in two parcels, his materials for the lime, whether that be chalk or stone ; and his fuel.

The fuel he may suit to his best convenience, for almost
any

any thing that will burn will do. Coals or wood serve equally: or very good lime may be made with furze bushes, peat, or fern; which last, though so light a weed, burns with a surprizing force.

When all is ready, he is to begin by laying a layer of the stone or chalk loosely upon the grate, and over that a layer of fuel: thus he is to continue putting on a layer of one, and a layer of another, till the kiln is full, taking care that the uppermost layer be of the fuel.

Fire is then to be given to the fuel at the ash-hole, and it must be left to burn up: the lime will be made of itself, without farther trouble. This is the general method.

A hundred of three foot faggots will burn forty bushel of chalk. If sea-coal be used, ten bushel will stand for the hundred of faggots; and the lime will be made in four and twenty hours.

Lime-stone, according to its hardness, takes more time, and a larger quantity of firing: but, in general, it answers very well to the expence; being preferable to that made of chalk.

Chalk loses about one third in burning; stone loses also in proportion; thirty bushels of chalk make twenty of good lime, and so in proportion, according to the nature of the stone.

Where chippings of marble can be had, they make the finest lime: but these can seldom be in the farmer's reach.

In Derbyshire they throw out, among the refuse of the lead mines, a kind of shining stone, which they call spar. It looks somewhat like crystal, only not so clear: or like large lumps of bay salt. It is whitish, brownish, or of other colours, and some of it that rises in square lumps is used for ornamenting of grottoes. This is an excellent stone for lime. They burn it wherever it is to be had, and dress their barren lime-stone lands with it: one bushel of this lime is as good as two of any other kind.

The softest chalks, and some sorts of marle, may be also burnt to lime with great profit. One bushel of marle in lime, is equal to five in the common way: in the choice of what kind to use, the farmer must have recourse to his aqua fortis, some will ferment and rise in bubbles with it, and some will not. That which ferments is fit for lime.

These soft substances are best burnt with fern, and eighteen hours generally bring them to lime.

We shall now consider in what manner, and on what sorts of soils, he is to use it.

C H A P. XXXVI.

Of the manner of using lime as a manure.

LIME is not one of those manures, which do equally on all soils. It does well on light and dry lands, but not on heavy and moist.

Sandy, gravelly, and stony grounds are improved by lime: but clays get little good by it. Many barren tracts in this kingdom are sandy; and lime has been used with such success as an improver on these, that it is surprizing it has not been try'd every where.

Fortunes might be made by enclosing heathy grounds, and dressing them with lime; but husbandry is not yet an universal science.

There are lands, which, at this time, lett for the price of the best in their neighbourhood, which fourscore years ago would not bring half a crown an acre: the beginning of these improvements has been by lime.

The common custom is to use lime alone; it takes greater effects when mix'd with other matters.

Some have sent for lime many miles by waggon loads, and have found it answer: but in this there is a double disadvantage; the price is greater, and the lime is certainly the worse. For when it is used alone, the best way is to take it hot from the kiln. The part which is lost in keeping or carriage, is the best of all. This should be the practice upon the most barren and desperate lands: for others it does better when a little cool'd, and in mixtures.

The way of using lime alone, to the greatest advantage, is by laying it, in a proper manner, on the lands sometime before it is intended to plow them up in the following manner.

Let the lime be carried hot from the kiln, in the quantity of about an hundred and fifty bushels to an acre. Let it be laid in small heaps, and each of these cover'd with earth. In this manner let it remain to receive the dews and showers, till thoroughly slak'd: it will then easily mix with the earth, and may be conveniently spread and plowed in.

This, though it appear a way of using the lime alone, really has the advantage of a mixture, which incorporates
better

better with the ground, than it would do alone. But in the plainest way of using it singly, it does more than any other manure.

Stone lime, sprinkled over a bare piece of poor, sandy, barren ground, and left to flake, will render it fruitful without farther care or trouble. Nothing need be done but the common plowings and sowing, and there will be a good crop: but not so large as if the same lime had been used with better management.

Stone lime is the best for gravels and stony soils: chalk lime does better on the loose barren wastes, where there is only sand and a poor earth. On light soils that have some heart, the best kind of all is that made by a slight burning of the softest chalk, or of marle; or that light kind of lime which they make in some places, of broken chalk wetted and moulded like bricks.

By observing these rules of suiting the lime to the soil, the farmer may reap double the advantage he could from a random and inconsiderate use of this manure.

Nature is kind to the farmer, if he will lay hold of the advantages. Where there is a stony soil that requires stone lime, he will commonly find lime stone for the making it, ready at hand.

We now come to speak of the mixtures that may be made with lime, for using it to most advantage: these are three; 1. Dung; 2. Mould or mud; and 3. Ashes. Of all these trials have been made with success.

For a barren sandy soil, experience shews the best manure is a compost of lime and cow dung. The cow dung should be double the quantity of the lime. It must be mix'd with it hot from the kiln, and then laid up in heaps, cover'd with a thin crust of the soil par'd from the surface. Let this be done a year before the ground is broken up. But as soon as the rains and dews have thoroughly slack'd the lime, let the heaps be broken, and after mixing thoroughly the lime, dung, and earth together, let the whole be spread as even as possibly over the land. The produce upon plowing at a proper season will be very great, and the ground will have a more lasting benefit than from lime alone.

Some mix horse dung with lime, and dress'd their light soils with it; but cow dung is better.

For a dry gravelly soil the best way of using lime is, mix'd with fine mould or river mud.

If mould be used there should be four times the quantity of

of the lime, if it be mud three times as much is sufficient ; but the mud must not be fresh from the river, for that would slack the lime too suddenly ; but such as has lain spread out, 'till it is crack'd on the surface, and is tolerably dry. Either mixture is excellent, giving a lasting heart to such land, as well as the warmth for the present crop.

For a mossy ground the best way of using lime is with ashes ; and none are so good for this purpose, as those of the land itself. The best way of doing it is thus.

If the land be sedgey set fire to the dry stuff on the surface, and let it take its own time to burn. This will often burn away two or three inches of the soil, sometimes a great deal more, leaving the ashes spread very evenly and well. The lime is then to be sprinkled over these, about an hundred bushels to the acre, and all plowed in.

If the surface will not burn thus, the turf must be pared off under ; and the ashes, after the turf has been burnt, are to be mix'd with lime, and plowed in as before. The mixture of the lime and ashes takes an effect much greater than either could have done alone ; and the worst kind of mossy land will be thus improved, to such a degree, that a first crop shall pay all the expence of dressing and enclosure.

As to the time the benefit arising from lime lasts, there is great difference from the nature of the soil, and of the lime itself, and from the manner of using it. One complaint is, lime is expensive, and its good is not lasting : but this may be remedy'd by due care and management.

A great deal of the expence of lime may be saved, if the farmer find the materials, and burn it for himself ; and the benefit arising to lands from its use may be made much more lasting, by the proper mixtures ; and by a right care of the land itself.

The worst dressing with lime of the weakest kind, will have the same lasting as dung ; that is, it will enrich the land for three years. Good stone lime well made and well laid in, will very well last five years. With horse dung its virtue will hardly hold out quite so long ; but with cow dung it will afford two good crops more. But it must be allowed, the first crops from horse dung and lime will be richer.

Lime, with ashes made by burning the land, lasts three years in its full effect : but then the land is not left so impoverished, as it is where the burning has been practised on it alone.

The dressings of lime and mould, are the most durable
of

of all: with a little refreshment of the land, at times, these will last ten or twelve years.

Additions to the article of lime, from a correspondent.

Such improvements have been made by lime of late, and such quantities are now burnt, that it may deservedly be called, a general practice; and, perhaps, the most useful in the whole kingdom. Consequently it deserves to be consider'd in a very particular manner, from the method of getting it in the stone pit, to the manner of burning it into lime, and through the various ways wherein it may be usefully applied, as well as the several great improvements produced by it, to almost all sorts of corn land, and grass grounds.

Lime-stone ground is generally of a sweet and rich nature, and the waters which run from it, very much improve the lands they flow over; whereas those waters which come from barren heaths, and several other sorts of hard land, are frequently prejudicial.

The richness of the dove bank lands in Staffordshire, which have been esteem'd equal to any in England for feeding, is greatly owing to waters running from the lime-stone hills, and the sheep dung they carry with them; so that they who have proper opportunities of turning lime-stone water over their grounds, may know how to apply it for their particular benefit. The wash of plowed fields and rich meadows are also frequently very advantageous, where they can be properly applied, as well as the wash of rivers passing near great towns.

Indeed lime-stone, which has not been burnt, will alter ground for the better, as is evident from several places on the moors, where loads of lime-stone having been shot down, and lain there some time, and it has quite alter'd the produce from a coarse four grass, to that of a kind sweet sort.

There are two sorts of lime-stone met with in Derbyshire, one a beddyfort almost in courses, in some places almost as even as bricks. This is generally got easily, especially if beds of earth lie mixed with it; of which a man will then get in a day, ten or a dozen ton or more; this sort is commonly of a yellowish cast, and in general makes the whitest lime: a solid square yard is commonly computed a ton.

The other kind is usually of a more rocky nature, and much harder to be got; so that we are often forc'd to blast it

it with gun powder. If the rock be firm, it is scarce to be thought what large pieces of the stone will be thus blown into the air, and how a little powder in an augur-hole, at about twelve inches deep, cover'd with sand, will pierce the most solid rock, shake it, and open the joints so that it may be got out by wedges: but if the rock be jointy, the blasts will generally have little effect, as the powder then finds a passage through the joints.

Stone of this sort is much the same as peak marble, and where it will bear polishing, is got and used for that purpose, and very large pieces are met with in some places proper for it.

This stone is of a blueish cast, and specifically heavier foot for foot than the other: consequently it must turn out more lime when burnt, and is generally esteemed stronger for land than the other, though the former is whiter. Here I cannot but observe, that I never knew or heard that any workmen, though employ'd for numbers of years, and almost constantly both day and night, engaged in the smell and smoke of a lime kiln, were ever prejudiced in their health by it, tho' it is death to all vermin about them. We have frequently instances of persons losing the use of their limbs, or their lives, by going too soon into fresh built houses, or rooms new shot with lime, before the mortar made of this lime and sand, has been very well aired, and long seasoned.

In this last mention'd stone are found that infinite variety of seeming shells and bones, which are visible in the peak marble; and, to give any tolerable account of which, has so much perplexed the philosophers.

I have seen numbers of petrified cockles, oysters, and bones of fish; and have one which is in appearance the petrified round back bone of a fish, with fine rising sharp edges, at equal distances, not half an inch diameter; the whole of about three inches long, fast at each end in the piece of the lime-stone.

There are two sorts of sale lime kilns used in different parts of Staffordshire and Derbyshire; one of which they fill, and close, or shut up, burn it, and let it cool; and then draw all the lime out, the days being appointed for the farmers to fetch it. These kilns generally hold thirty or forty quarters of lime, being six or eight waggon loads.

And indeed every new lighting a kiln occasions such loss and expence, considering the quantity of lime burnt in one, that few like it; for which reason those called running kilns, com-

commonly kept in from the time they are lighted, as long as they have custom, and often from April to October, are generally chose for sale kilns; as also by those who burn for their own private use.

The publick running sale kilns are generally about seven yards deep, and contrived either at the side of a hill, or by sinking the ground, so that the workmen may have room at the bottom under the cover of the kiln to draw out the lime, and also conveniency to lay some by, and to set some loads ready for customers. The top of it is to be readily come at, to bring the stone and coals to burn it with, and to have room to break the stone, and fill the kiln.

The bottom should be laid with a good stone dipping toward the mouth it is drawn at; and at about two foot high, there is a stone runs cross the kiln, called a horse, for the lime to fall down on each side of it, and to prevent the lime falling altogether. This stone ought to be such as will bear the fire, since if it break, the whole must sometimes be drawn out again not well burnt. The stone facing of the inner part should also be of the same nature, especially toward the bottom. Sometimes indeed lime-stones are used also for the inside near the top. They will last a year, and may be easily repaired the following spring.

The kiln hence widens gradually from the bottom to nine or ten foot high, to about nine foot wide, for about two thirds of the height, and then is drawn in again gradually to about six foot wide, which makes it burn better; it also saves coal, and is easier closed up at the night till morning; so that the fire gets not up too soon and wastes, when the stone is commonly heaped up high like a pyramid.

At first lighting it, towards the bottom, they use wood or gorse (furze) then half coal and half stone, and encrease the quantity of stone gradually, till they set on twenty scuttle full of coals to sixty of stone, which is called a bed, which stone is about a ton; and when the kiln is warm and goes well, one horse load of sleek, or coals, will burn two and an half, three, and sometimes, in good weather, more loads of lime. A kiln will draw seventy or eighty sale horse loads a day, which are generally about three bushels, even by the wood, to the load, or two and an half full up-heap'd measure: two bushels which I burnt, of full measure, was fourteen stone weight, and few sale carriers will carry more. What is called a bushel in the south, is called a strike in those counties.

The coals, or sleek, they burn lime with, are usually an ordinary

ordinary sort of coal, subject to smell and smoak very much, and consequently are little burnt in better families; the price of them is about two-pence per load, and the expence of carriage, according to the distance from the lime kiln, generally about a penny a mile in Staffordshire.

These running kilns burn lime cheaper, and full as well as those that are only once filled, burnt, and let out again; and they have not so much waste in proportion.

A running sale kiln employs four men; one to get the stone, one to wheel it to the kiln, and the other to draw the lime, fill the bags, and help to load horses, and set on beds of stone and coals above, in proportion to what is drawn below.

The wheeler has but common labourer's wages, the stone-getter, according to the nature of the stone, but the two burners, who seldom leave the kiln, except, one way or other, near double labourer's wages, or more; especially as they should be experienced persons, and are generally tied to it from April or May, till October, according to the season and custom. Thus any person may pretty well compute the general expence of burning of lime, great part of which depends on the nearness and cheapness of coals and lime-stone.

The building my private kiln cost me about three pounds, and it would draw fifty, or near sixty quarters per week of up-heaped measure; and with very little repairing it has lasted, occasionally, above thirty years; and I had the stone got and bedded, and gave a man and his boy one shilling and six-pence for each ten quarter they burnt and delivered, but I generally let him have some farther advantages.

The curious will excuse my mentioning an observation, made by several lime-burners; that all the art they have, about May they cannot keep the lime from falling to powder, though they can, for a considerable time, at all other seasons; and some of them think the return of the heat and spring has an influence upon the stone, as well as upon plants and animals.

There is one thing relating to lime, it may be proper to caution those concerned with it, to be careful about; which is, that they be very careful how they lay it in buildings, or near wood, or any thing combustible, since it is very subject, on wet coming to it, or even sometimes with the moisture of the air or earth, to fire any thing near it. And on very

very wet days lime has sometimes fired the sacks on the horses back, and the carriages it is taken in from the kiln.

The common price at the sale kilns, near Buxton in Derbyshire, and at Caldon Grange in Staffordshire, is about five shillings and six-pence the sale load per score, and four-pence per load to farmers, who generally carry three up-heaped bushels : and from those two places, I apprehend, there are full a thousand loads a day carried round the country, besides what private persons burn for their own use.

Some of the present lime burners, at the publick sale kilns, now make use of waggons, like those used to run on wooden frames, at the coal pits in Shropshire, and at Newcastle ; which, going on low wooden wheels, and on a frame of wood, are easily loaded, and drawn from one place to another ; and, when placed over the boat, forty hundred of coals are unloaded into the boat in an instant, by opening a trap door at the bottom of the waggon, and the coals drop down. The lime burners load waggons like those with stone, broken to the proper size at the stone pit, and then draw the waggon over the kiln, on a frame, and then unload it into it by the trap door ; which saves all the usual filling of wickets, and then throwing them into the kiln one by one. By this method two men almost do the work of four, to the great weekly advantage of the owners.

Old stone is neither so easily burnt, or makes such kind lime as that which is new got, and even lying a few days when got, exposed to the air and weather, is to its disadvantage in the burning it into lime, as well as the out part of the lime-stone rock, which has been long exposed to the wind and weather. The same has been commonly observed of several sorts of free-stone, that they are much softer and easier worked when new got, than when they have been exposed to, and hardened by, the air, sun, and weather.

There is some art and care necessary in breaking the stone in proper sizes for the kiln, and the great hammers are made with faces suitable to that purpose ; for a large flat stone will be burnt well, when a round one will not, though of much less size. And the throwing in much small stone is subject to choak the fire, nor is it chose but when they lay some round the edges, to prevent the fire burning too furiously there.

Before I enter into the general or particular uses of lime, there are two or three things which, from my own and other peoples experience, I would particularly recommend to the farmer.

The

The first is, to lime the ground (I speak chiefly here of grass ground) as soon in the year as conveniently may be; for I am satisfied that lime laid on ground before Midsummer, is much more beneficial to it, than what is laid on some time after. And the later it is laid on in the year, it must be proportionably the worse for it; though the lime burners will tell you it is equally good then.

As to laying it on ploughed land, the course of tillage must be observed; but as to compositions, or mixtures of lime and dung, and soil, &c. the season of the year is not so much to be regarded.

In all these cases I would advise, not to let it lie and mortar (as they call it) before it is used, which is a great mistake, and very prejudicial, though I have known some old farmers practise it; but by all means spread the lime while it is in the flour, when it is laid on grass ground.

It is not advisable to lay lime on where there is much grass on the ground, which certainly must prevent its having so good an effect, as it will when the ground is barer; nor will a farmer be surprized to find his cattle will not touch the new limed ground, until some rain has fallen to wash the lime a little in. After this they will eat of it, and prefer the grass of the limed ground to any quantity of grass of the unlimed part of the same field. In a long dry time it would not be prudent to lime a pasture all at once, for the reason above.

The most learned do not always pretend to assign causes. — “ I confess (says an ingenious gentleman) that I am ignorant of the cause of this great power (of lime) whose effects are astonishing, as much as I am of elasticity or attraction; though perhaps it is nothing but a modification of those two conjoined, acting on, and exciting the fluid of fire, which pervades, and is contained in every thing.” But however unknown the cause may be, or whatever disputes there may have been, to what sort of land lime is properly applicable, and to which not; yet all agree, that it is an excellent manure, rightly and discreetly applied, though they differ as to its operative effects, and the manner.

What I am at present concern'd in, is not now to explain the nature of lime, or its surprizing effects, and the manner of its working; but to shew how best to preserve that power, and apply it best to the ends, that is, the farmer's benefit; and not to let its virtue be lost, or wasted to no purpose; which

which will explain, and in some measure, justify the directions above given.

It seems evident, that the benefit of lime must arise from something in the nature of the stone itself, or from the heat communicated to it in the lime-kiln, or from both; therefore the sooner it is applied the greater effect it must have; for it is evident, that it loses its heat and virtue by lying exposed to the air, and that if wet gets to it, it must cool the heat of it, and will make it (as they call it) clatter in lumps, which must not only weaken the force of the fire within it, but prevent the fine particles of it from operating, as they would otherwise do; and will prevent, or at least lessen, that fermentation which is generally thought to produce that useful vegetation occasioned by lime.

If lime is laid on the ground early, and when it is bare, whilst fair warm weather may reasonably be expected; and is spread whilst it is the flour, it will then enter the pores of the earth, and produce the desired effect much better than when rains fall, or cold frosty nights lessen its goodness, or when much grass, or the dews coming on it cool the lime, or absorb the fine particles of it, or at least prevent its easy entering into the ground.

It would be of no use to the farmer to pretend to explain the real nature of lime, or the manner how it operates.

That it assists vegetation in numerous instances is evident beyond dispute; and from the many experiments already made, we may conclude, that the same causes will produce the same effects: and consequently we may justly apply it in the same manner, and thereby reasonably hope to obtain the same profitable end.

By duly considering the strength of our lime, the nature of the several soils, the different grass grounds, the various plow grounds, and the very different plants and herbs, to which we may, or intend to apply lime; we may learn to proportion it to them respectively in such manner, and in those suitable seasons, as may best tend to their several improvements: and thereby learn to avoid every thing prejudicial, which the over-liming lands, or liming them improperly, might occasion.

Mr. Ellis concludes, that lime agrees best of all with the cold wet clays, because his neighbour with the limy rubbish of his kiln, dresses his high clay grounds that annually returns him vast crops *.

If

* Vol. 3. p. 392—5.

If I understand Mr. Ellis right, what he calls limy rubbish at the sale kilns, is called lime asse, and is of so little value, that vast heaps of it are thrown by, it not being thought worth the carriage to any distance, as being a mixture of small lime, refuse of the coals, and accidental rubbish; and a cart load of it is not thought of equal value for the ground as a horse load of good lime; and accordingly when used it is laid as thick on the ground as common dung.

This limy rubbish partaking much of the nature of ashes, can be no good argument for lime being best for cold wet clays, which it certainly is not fit for; though this rubbish might improve his neighbours wet ground, and such will be of service to land of this sort when laid on in great quantities. If chalk was burnt by Mr. Ellis's neighbour, it will be stronger against Mr. Ellis, as that is not equal to lime-stone in strength and goodness.

Lime is found very beneficial to dry lime-stone ground, where there is a tolerable depth of earth, but should you lay a great quantity of it where the soil is shallow, you would not only lose the expence of the lime, but prejudice the ground.

No experienced farmer would expect any useful produce from lime laid on an entire clay, or on an heap of bare dry sand, without what we call earth or loam, or some mix'd soil over it. There are some lands very near such bare clay and sand, to be met with in several places, and to lay lime directly on either of them, would certainly be both labour and expence in vain.

Too large a quantity of lime may be hurtful, and this is the case in all manures whatsoever, both natural and artificial. For too great a quantity of any of them, instead of improving land, will certainly spoil the present produce of it, and sometimes hurt it for years; till different husbandry, or the repeated operation of the sun, air, and weather, have brought the land again to a proper temperament.

Instances of great faults of this kind in dungs are not very common, and where they are committed, the land will generally sooner recover of itself.

But there are instances of marle, and of salt water, frequently to be met with. If too much of the former be laid on, or too much of the latter lie long on, or come too frequently over the ground, such land will not be of any tolerable goodness for many years; and in some of these instances

stances never, until the cause be removed, or a fit remedy applied.

There have been several instances of over-marling land in Cheshire, by which the ground has been quite spoiled for many years; which yet after the sun, air, &c. have reduced it to a proper temperament, has been very fruitful for many years after.

As to such effects of salt, though that is certainly an advantageous improvement, when properly applied; yet there are numerous instances where the salt water accidentally lying too long on, has spoiled the ground for a year or two, which nevertheless has been very fruitful for many years after.

This was the case of several meadows of a near relation of mine after the great storm, as well as of several others.

What will make this matter evident beyond dispute is, the case of the marshes and lands near the sea, which if they be constantly overflow'd every tide, produce very little of any kind of value; and the lands adjoining to the sea, if too often overflowed (by the banks being let down) by high tides. The prejudicial effects are very visible, for a stranger may see by the sort of grass how far the sea water usually or accidentally comes.

But when these lands are well banked against the tides, those meadows soon come to be good, and those very sea marshes gradually improve without any manner of addition, or husbandry, to very good pasture grounds.

The same effects must be naturally expected, and are accordingly found where land is overlimed; which recovers not, till tendered and altered by the application of things of a different nature, or mellowed by time.

Is not this also the case of every one of the different improvements above mentioned, and in a thousand other instances? In which if too much of one sort of manure or improvement for one sort of tree or vegetable be applied, it hinders its growth, and perhaps prove fatal: when this very same quantity of manure would encrease the growth and goodness of other particular trees and vegetables, after a surprizing manner.

On all ground where any one would offer to lay lime, there is a coat of earth or loam, though sometimes very thin, not even an inch and an half in some places, and in others to a very great depth; in both lime will be useful, if applied seasonably and in proper quantities, according to

the depth, the tenderness, or stiff nature of the soil ; and it is the just proportioning the one to the other, in which the art of making lime, and indeed of all other manures, beneficial, consists.

In the moor lands in Staffordshire, where the ground is generally moist, and the soil tender, and often very shallow, lime spread on the surface, without any further care, sweetens the ground generally in two or three years, and produces a good kind of grass. This will continue as other lands, unless impoverished by too much plowing, or carrying off the produce, by which any land may be prejudiced ; but here, if you plow into the clay, you spoil the land.

I have limed land of this sort from four to nine inches deep of soil, laying on forty bushels, up-heaped, on an acre ; some of which pastured pretty well in two or three years, whilst other parts of it were six or seven years before it answered well ; after which I have plowed it up, and had very good turneps, where I sowed some, and good crops of oats on other parts. And it will now pasture very well, and mow after, provided it be not plowed above two or three years, and it would be well then to give it a little dung.

In moist lands of this sort the lime is subject to sink deep where the soil is so ; for which reason it is oft convenient to plow it before it be gone too far, and the benefit of it, in some measure, lost out of the reach of the corn and grass growing on it.

In the Peak of Derbyshire a great quantity of lime-stone ground, with a coarse turf, has been improved with only liming it, and then letting it lie for pasture without any further trouble. Some persons have got estates by taking long leases of parcels of commons, when divided, and then liming and setting them out again.

Here it may not be unuseful to mention what happened to one of my tenants, who was a very good housewife, yet found her cheese bad, though made as usual, the year after the ground was limed : this had so enriched the milk, that it was necessary to break the curd a great deal smaller than she usually had done, to make her cheese then good ; which she thenceforward observed, and made an exceeding good kind.

These instances confirm what was before mentioned, that lime sweetens land, not fours it, as Mr. Switzer mentions ;

nor is it to be taken as one of its good qualities, to absorb the wet, as Mr. Ellis imagines.

The great art in relation to lime; is, how to proportion the sorts and quantity to the different soils, and to the nature of the things desired to be produced; which may be easily collected, from what is before mentioned; and in any uncommon case, may be readily brought to a certainty, by a few trials on small quantities of land; and in most cases, especially in good land, with shallow soil, it is better to repeat, than to lay great quantities of lime on at one time. O.

CHAP. XXXVII.

Of soot.

SOOT is another of the artificial manures, which is also the product of fire. Ashes also of various kinds come in a natural way, from the effect of fire upon our common fuel, at the same time that the soot is formed: and they are beneficial to the farmer.

Soot is of two kinds, one, that which arises from wood, the other that of coal. These differ in many particular respects, but they are nearly the same in their effects and value to the farmer. Wood soot is solid and shining, coal soot looser, and of a deader colour. Wood soot sells in London at a great price, in comparison of the other, for the use of chymists and apothecaries, because it is scarcer, the fuel of London being, in general, coal: but in the country, where this is as common and cheap as the other, the farmers prefer coal soot before it.

Those who have written on husbandry, differ as to the kind to which they should give the preference. Mortimer says sea-coal soot is by much the best, and Worlidge tells us, that soot is a good manure, especially such as is made of wood: these are both very honest and good writers, but experience is to be prefer'd to either. The truth is, that neither kind deserves a general preference, but that wood soot is better for some soils, and coal soot for others. The latter is best on the greatest number of soils, and therefore the farmer is right in valuing it the more. However, this difference is not so great, that any danger can arise from a mistake; for such land as will do well with one kind of

foot, will also with another: all that the best choice can do, gives only a little advantage.

As there are soils which refuse the assistance of some of the most enriching manures; there are others of equal efficacy, which perfectly well agree with them. This is exactly the case in the present instance. Clayey soils will not bear lime; but foot is the peculiar and appropriated manure for these; and it will do for them, all that lime does for the others. But in this the foot has the advantage of the lime, that there is no soil whatsoever but it suits.

For suiting the particular kinds of foot to the different soils, the rule is this. For clayey, chalky, and mossy lands, coal foot is best. And this is the reason why the coal foot is most in repute in London for this traffick, because the Hertfordshire farmers, who buy it almost entirely, have, for the most part, clayey or chalky soils.

For gravelly, sandy, and loamy soils, wood foot is preferable to that of coal: and in its nature indeed this kind is better and richer than the other, because, being made from a vegetable substance, it is richer and warmer than that other which comes from a mineral origin; but the great reason of the difference which suits one kind to one soil, and another to another, is the consistence. Wood foot is in firmer and harder lumps; coal foot is crumbly. Now in a clayey or a mossy soil, the lumps of wood foot would lie a long time unbroken, whereas the coal foot breaks and mixes with it immediately. Experience shews also, that wood foot will lie in large pieces a long time in a chalky land; whereas the gravelly sands, and sandy loams, cut and break it to pieces in two or three plowings, and spread and mix it thoroughly.

The benefit of wood foot is more lasting than that of coal; but what the farmer expects from foot is, an immediate effect upon the corn: and in this he is not disappointed, even on his coldest clayey lands. The effect is like magick. If the foot be sprinkled early over the land, the first shoot of the corn will presently be enough to preserve the root, and stand all injuries; and the virtue will continue with it to the full ripening of the ear. A field that has been dress'd with foot may be distinguished from one that has not, only by the appearance of the crop, at any time. There is a strength and freshness the foot gives, that nothing else can.

Soot goes a great way upon any kind of land. A bushel
of

of it, if tolerably good, is equal to a load of dung. Twenty bushels of foot is a very fair allowance for an acre.

Sheeps dung is, of all manures, the best for a dry chalk; but the next in value to that is foot. For the sandy soils lime and foot are the two great improvements; and the advantage of foot on gravels would be better known than it is, if it were not that the practice of folding took its place; than which indeed nothing is better.

The best season for laying on of foot is the end of February, and as the quantity necessary is small, in proportion to other manures, the more care must be taken to spread it evenly; the spring rains wash it in, when thus laid on; and the effect is immediately seen.

The benefit of foot is not confin'd to corn lands; it is of equal use on pastures; and particularly on those of a clayey soil. When the coldness and hardness of the ground has scarce suffer'd a tolerable swarth to appear of many years, a single dressing of foot, sprinkled on before the spring rains, has been known to produce instantly, as it were, a thick covering of a fine sprightly green; with the leaves full, juicy and upright, and all the signs of health and strength. This has continu'd a long time, though on corn land the fruitfulness from the same manure is short.

Coal foot is greatly to be prefer'd to wood foot for pasture grounds; for as there is there nothing to break the lumps, they might lie a great while, and give half their virtue to the air, instead of enriching the land. Coal foot, on the other hand, washes all in immediately. After half a dozen showers, if the foot were pure and fine, it is not to be seen that any thing has been on the ground. Ashes are often mixed with foot, by those who sell it for the sake of greater profit, but here the cheat is at once discovered.

I would advise the sprinkling a larger quantity of foot on pasture, than is the allowance for corn lands: about thirty bushels to the acre: and this is worth while, as the effect is so much more lasting.

The writers on husbandry direct forty bushels to an acre of corn land; and though the present universal practice allows but about twenty, perhaps the farmer would find he got more, in the end, by this double allowance, even to his plowed fields.

CHAP. XXXVIII.

Of ashes.

ASHES of every kind, are of use to the farmer, but in these there is a great deal more difference than in foot.

Ashes may be reduced to three kinds. 1. The ashes of his common fires. 2. The ashes made by burning stubble, fern, furzes, and other useless products of the land; and, 3. The ashes of the land itself produced by what we call burnbaiting.

The first of these heads may be consider'd also in a double light, for there is a great difference arising from the fuel; the ashes of sea-coal being different from the ashes of wood; and those of peat from both.

When the farmer's fuel is wood or peat, the ashes of his hearth differ very little from those of fern or stubble; but when he burns pit or sea-coal, they are quite of a different nature.

I heard in Lancashire a very great account of the ashes of what they call cannel-coal; but upon examining strictly into that matter, I think them inferior to our common sea-coal ashes: they have no more richness, and they want that harshness or sharpness which the others have. So that they enrich no more, and they do not divide the land so much.

The ashes of Scotch-coal, which are white and soft, are of a middle nature between the Lancashire cannel-ashes, and those of the London sea-coal. They are better than the former, and not so good as the latter: and this for the same reason, as the others are worse, they want harshness to cut a tough soil; and this is one great advantage arising from the use of all the firmer kinds of manures.

Wood-ashes enrich a soil more than coal; coal-ashes divide a soil more than they, and they enrich it also, tho' in a less degree: coal-ashes are best for a tough clayey soil, and wood-ashes for a light, poor and barren; or a too wet land. Cold and damp lands, receive most advantage from ashes of whatever kind.

Some think themselves frugal in buying up wood-ashes, after they have been used in the bucking of linnen; but they

they deceive themselves, those ashes have lost their salt, and are little more than so much dust.

Wood-ashes when fresh and full of salt, should be used alone. Coal-ashes having less richness, are best mix'd with dung: horse dung is fittest for this service; or else the compost of all kinds of dung together; and this way they make an excellent manure. The sharpness of the ashes opening the land, and letting in the virtue of the dung.

Any soil that is too damp, will have advantage from a good dressing of ashes: and where the dampness is the principal fault, coal-ashes are found to succeed better than those of wood.

Soap boilers ashes after they have done with them have also great virtue.

It is for their correcting damp grounds, that ashes, and especially the kind last mention'd, are so famous in Lancashire, for the improvement of their mossy lands, and destroying rushes.

The quantity of ashes to be us'd as a dressing, should be four load of wood, and six of coal, for an acre, the quantity may be increased; and especially that of the coal ashes, which in countries where coal is the fuel, cost nothing but carriage.

Since ashes us'd in bucking have no virtue, we see wood-ashes may be robbed of all their efficacy by water; for this reason they must be laid up for use in some dry place, and no wet of any kind suffer'd to come near them: otherwise the farmer may chance to lay dust upon his land when he thinks he is giving it a rich dressing.

Coal-ashes having a salt also, though not so much as wood-ashes, should be kept dry in order to preserve their virtue; for if they lie expos'd to the rains, they will be reduced to a mere useless matter: but it is found by experience, that if these be moisten'd by emptying the pots upon them from time to time; as also by throwing on them waste soap suds, in which cloths have been wash'd, or other such liquors as have a salt in them, they are enrich'd, and will go farther than alone.

Ashes made by burning weeds, beanstalks, stubble, and other vegetable matters, are little different from the common ashes of the hearth, where wood is burnt: they are somewhat lighter, and easily part with their salt by the rain. When they are burnt upon the ground, they are well scat-

tered, and sprinkled equally, which does not always happen with such as are carried on in loads.

Peat-ashes are of a particular kind, they are lighter and softer than all others : but in general they are of the same virtue with the ashes of vegetables ; more like those of stubble, and other light kinds, than wood-ashes. All these give great fertility both to corn and meadow land ; and the last nearer than any other, approach to that kind which is made by burning the surface of the land. But there is still this great difference, that in the burning the land the soil is prepared also to receive them.

The best use of wood-ashes is strewing them by hand over wheat lands, in the beginning of the spring. This purpose they answer best if they have been kept under cover, and wetted gently with the emptying the chamber pots on them from time to time. The proper quantity is about fifty bushels to an acre ; and as they come cheap enough where wood is the fuel, this is no great matter.

The farmers in Hertfordshire and Buckinghamshire, have found by repeated experience, that these ashes answer the purpose of their foot dressings : they value the discovery for its saving the price of foot : but they may value it on a double account, where foot is not to be had in quantities, as is the complaint in most places in England. The increase this top dressing of ashes causes to the crop, is greater than they could conceive who have not seen it.

The use of wood-ashes thus prepared, is not confined to corn lands, they are excellent also on pasture ground ; but on this there must be a larger allowance : fourscore bushels is about the right quantity to an acre. They not only cause an early and plentiful shoot of the grass, but destroy those insects which are apt to harbour about the roots to the great injury of the land.

Coal-ashes preserved and wetted in the same manner, answer excellently on pasture grounds, and fifty bushels of these will go as far as eighty of wood. On pasture grounds the wood-ashes take a more immediate effect, but that of the coal-ashes is more lasting. The first year's grass will be more plentiful from the wood-ashes, but the effect is less afterwards, whereas the coal-ashes continue their efficacy four or five years.

Coal-ashes are excellent for clover, saintfoine, and the other grasses of that kind. The way of using them is soon after the depth of winter, to sprinkle them at the rate of
fifty

fifty bushel to the acre, and the rains washing them in they do excellent service.

It is a custom in some places to spread coal-ashes on the young wheat, but wood-ashes are best for this purpose.

Where peat-ashes are to be had, they exceed every other kind for clover and saintfoine. But there requires a large quantity of them.

Ashes also do excellently well in many composts. Wood-ashes are a fine mixture with cow dung: they also enrich the heaps of soil that are made from refuse and dung thrown together. And coal-ashes are an excellent addition to the earth that is mix'd with hens dung; nothing so readily breaking the stringy toughness of that rich, but otherwise untractable manure.

Coal-ashes agree with a clayey soil, and wood-ashes with the loamy and gravelly: but either may be us'd in the place of the other without damage, only there will not be so much advantage where they are laid on inconsiderately; as where they are suited to the soil.

C H A P. XXXIX.

Of burnbaiting.

TO the improvements of land by ashes, may be refer'd the great and valuable practice of burning the baite or turf, called burnbaiting, and denfiring of land, from the name of the county in which it was first a general practice*.

Burnbaiting is perform'd by cutting off the turf of the ground, piling it up in heaps to dry, and afterwards burning it to ashes; which ashes are spread over the naked surface, and plow'd in. This is the practice in general terms. For the sake of the practical husbandman, we shall lay down some instructions on the manner of performing it, before we enter on its advantages, which we hope to teach him not only to obtain but to preserve. This last article is a secret yet unknown to all our farmers.

The cutting off the turf, as universally done at this time, will admit great improvement. The present method is this.

A stout labourer pushes a breast plough before him by the strength and weight of his body and arms, at a small depth under the turf. This is a plain and poorly contriv'd in-

* Devonshire.

strument, consisting of a kind of share, with an edge for cutting the turf, a handle, and a cross piece at top. They pare off the turf with this about an inch thick, more or less, according to the quantity of roots, or other vegetable matter there is in it: the more there is of this, the thicker the turf is to be taken off. It is thus cut into pieces of a foot and half long, and nine or ten inches broad, and turn'd that it may dry.

A plow with a proper share, drawn by a horse, would perform this business in a much quicker and more advantageous manner. There is a very convenient instrument for the purpose, describ'd in a late treatise on this subject, which though I have not seen us'd, yet is so plainly fit for the purpose, that I shall propose it to the farmer's consideration.

A hollow plowshare rising with a sharp edge in the middle, from the point to the top, and having a fin both ways, beginning at the point and running back to the share, must be fix'd to a light and strong piece of ash sharpen'd forward, but left thick and strong behind.

The share should be two foot broad from point to point of the fins behind; a foot long; and a foot high. To the end of the ash pole must be fasten'd a strong piece of wood nearly perpendicular, but hanging a little backward: this must be two feet high, and on the top must be a cross piece for fastening the harness of the cattle. This is easily understood, and any country workman can execute it.

The handles of the plow, and the earth boards to turn the turf, are to be fix'd also into this square head. The instrument is then compleat, and every plow boy will be able to manage it properly with a little instruction.

He must begin at the edge of a field, and as he goes on, one turf will be turn'd toward the fence, the other inward. When he returns he must direct the plow just along the edge of the last mention'd turf, for it covers a part of the ground that is not cut up. This will be cut up at the return, and turn'd over with the other.

In this manner the whole field is to be pared, and the turf will lie in long pieces reaching from one side to the other. There requires after this the cutting it into lengths: but that must not be called an additional trouble, the former having been so very trifling in comparison of what is commonly requisite to that purpose. The gentleman who invented this plow, has also contriv'd a very plain and simple instrument for the purpose,

A roller is to be made of the trunk of a sound tree, firm, large, and heavy. It is to be hoop'd round at every two feet, and from the middle of each hoop is to rise, all round, a blade six inches deep, stout at the bottom to support it against bending, and sharp at the edge. The roller thus arm'd, is to be drawn over the whole field cross-ways; and its weight pressing the edges all the way down, the turf will be cut through and through at every two feet. By this means the whole surface will be cut into turfs of two feet long, and one broad, which is a proper size.

The turf being cut up, we are to proceed to the drying, piling, and burning of it: for howsoever plain and simple this operation may seem according to the few words in which writers have described it; a great part of the benefit the farmer is to reap from it, depends on a very critical regard to every part of the process.

If the soil be light, and the weather hot and fair, the turf will dry with once raising up and turning: but if its own dampness, or the wetness of the season prevent this, it must be piled together hollow, in little heaps; where a passage being left between the turfs for the wind, they will quickly be dry'd.

The turf will in some places burn singly and of itself when dry; in others it must be assisted.

When the soil is very poor, the turf thin, and few roots among it, it will not do alone. On the other hand where it is better, the turf cut deeper, and there is a great deal of roots in it, and of stalks, and dry leaves upon it, 'twill burn alone.

In the other case he is to strew a little dry heath or furzes under every heap, and if it be very poor, and he make his heaps large, he must mix some of the same dry stuff among the several of every heap.

'Tis best to make the heaps small, whatever be the soil, or the condition of the turf; they burn best, and being more numerous, they improve more of the surface of the ground in burning: for 'tis not only by means of the ashes that barren grounds thus treated are improv'd, the very heating of them by these several fires tends to divide their particles, and encrease the fertility.

Some make a great art of raising these little heaps, composing them of ten or a dozen turfs each, which they twist curiously together, leaving a hollow within; and holes between in several places, as if they ry'd them into knots like ribbands,

bands, or imitated the flourishes of a writing master's pen. They then draw in pieces of furze between the holes, and fill the hollow part with it. To this there is no objection, but that it is a great deal of needless trouble.

A good wheel-barrow load of the turf is sufficient for each heap, and if they are of the poor kind, a little dry furze should be laid upon the ground under and between them: this is all that is needful. The labourer then is to set them up end-ways, and edge-ways, as loose as he can; and when all the heaps are thus rais'd, and have stood a day or two for a farther drying, the furze is to be set on fire; and they will catch from it, and burn away sufficiently for the farmers purpose.

Many a husbandman after all his toil has lost half the advantage from the single circumstance of not regarding the proper degree of burning.

Fire carries off all the efficacious parts of most substances; but this it does gradually; and the progress may be seen. The farmer wants to reduce this turf to ashes; but as he wants these ashes to enrich his land, he should get them as full of virtue as he can.

If a plant be put into the fire, it burns away to ashes, but these ashes at different times differ very much in appearance, and in their qualities. When the plant first falls into ashes, those are of a blackish grey; and as they continue in the fire they become paler and paler, till they are at length perfectly white. While they are of a dark grey, they have a great deal of taste, but when they are burnt white, they are only a little brackish.

Chemists tell us, that this colour is owing to the oil of the plant, as is also the taste; and that this oil, burning away, leaves the ashes pale, and of half their virtue. Very likely the account is true. The colour and the taste must be owing to something, and whatever that is, it burns away afterwards.

We don't know what principle it is in ashes that gives fertility to the ground; but whatever it be, 'tis best to preserve it as entire as possible. Let us apply this reasoning to the husbandman's burnbaiting.

Let the farmer mark the course of the operation in the burning of one of these heaps of turf. He will find, provided the fire go on well, that at first all the heap looks blackish and dusky; when the turfs which compose it, begin to crack and crumble to pieces: a little while after this he

he will see them moulder into an heap of redish or yellowish ashes, with several lumps among them; and a while after a great part of the lumps will moulder away, and the ashes, in most parts, become of a pale grey; and in some places whitish.

It is easy, from the before mentioned directions, to know in which of all these states the turf is fittest for his purpose. While it is black and holds together, it is burnt but imperfectly; when it begins to crack and crumble to pieces, it comes nearer to a condition for his service: but the true state in which it is to be used is, when 'tis just moulder'd to pieces, but yet retains a yellowish or redish colour: the ashes are at this time thoroughly made, and yet they retain their full virtue. After this, every minute that they continue on fire, they lose some part of their goodness.

We are now naturally led to consider the proper degree of fire, for the bringing the turf to this state, with least loss of the virtue in burning.

All violence of heat wastes the virtue of the turf; therefore the farmer is to burn them by a slow and mouldering fire. The less additional fuel he uses the better: and that there may be occasion for as little as possible, he should dry the turf as perfectly as he can first. It is for this reason the ashes made from rich turf, are better than those from such as is poorer, for the rich kind consumes by itself, and that slowly.

I have known a farmer who thought he was doing his business to great perfection, in this article, dry his turf so well, and then put so large a quantity of furze under and between each heap, that the whole virtue of the turf was sent into the air, excepting what remains in all ashes. Every heap has blaz'd away like a bonfire, and the ashes have remain'd white, and in a manner insipid.

To preserve the full virtue of the ashes, a slow smothering fire is best. The inside of the heaps will be always more burnt than the outside, so 'tis enough, in many cases, if the outside be well crack'd, and ready to break to pieces with a small blow. In this no universal rule can be given, for the nature of the turf differs so much, that some will hang together till struck, when it is over-burnt, and other kinds will break and fall in before they are half reduc'd to the proper state. We have taken the only general method; that is, informing him of what is the right state of the burnt turf, for giving its full virtue. And his eye must watch this, and

take the proper opportunities of continuing or stopping the burning, when it is needful.

The farmer may guess, by the nature of the turf, what fire it will bear, and what addition of fuel it will want: this he is thoroughly to weigh before hand, for on this a great deal depends. The practice succeeds best when the hills will burn just as long as they should, and so may be left standing whole upon the ground. This will depend upon the quantity of fuel, and their own different nature. If too much fuel have been given them, and they continue burning within, after the very outside is done enough, then he is to break and spread them a little, so as to make them go out: but it is much best when they go out of themselves, and remain properly calcin'd and whole: for when they are thus broke and scatter'd, if a windy day come, half the ashes will be blown away.

The heaps being so well made, and the fuel so justly proportioned to the nature of the turf, the hills are all sufficiently burnt and stand entire.

The farmer is to leave them thus till thoroughly cold, and if any happen in any reasonable time, till there has been a good shower or two of rain, he is then to prepare for spreading of them, taking the advantage of a calm and still day.

He is to begin with paring the surface of the earth up to three or four inches depth all about each hill, and then removing the hill a little, he is to pare it somewhat deeper, just under its place of standing. These parings of the ground are to be thrown upon the hill, and all is to be then broken and mix'd together.

Not only the ashes of the turf fertilize the ground; but this very act of burning; the real and actual effect of the fire does great service to the land, so far as it reaches. A greater degree of fire alters the very quality of earth, and renders it unfit for vegetation, but fire, in this degree, only heats it enough to divide it, which is one great end of all dressings.

As the earth that was under these hills, and that just round about them, would be thus rendered more fruitful than that between one and another of them, the land would afterwards be fruitful in spots and patches: or the crop would be too rank in these places, and starved in others.

To prevent this, the farmer is to pare away the earth under and about each hill; and mix it with the ashes of that hill.

hill. The quantity of these ashes will be thus increased, and they, together with this earth which is thus enriched beyond the rest, will be regularly spread over the whole field.

Some add lime to the ashes, half a peck to every hill, supposing each hill made of a single wheelbarrow full; or more, as the hills are larger. They put this in under the hill, or among the ashes; and don't stir it till rains have come to flake it. This adds to the fruitfulness that follows, but it is not needful. May the danger of a piece of land that has been well dress'd in this manner is, that it should be too rich, and make the crop over rank. We therefore advise the farmer to make no use of lime, or any other addition to the ashes, except the earth, par'd up as before.

The best season for this is about the middle of May, for at that time the surface of the ground is generally in a good condition for burning. The April rains have made the roots shoot out, and the ensuing warmth has dry'd it. Beginning at this season also, he will have time for waiting every opportunity, to take advantage of weather; and will have his ground in thorough order for his seed.

After burning and spreading the ashes, he is to plow the land, and sow it; and this plowing must be the slightest imaginable. He must go to no great depth, and only just turn in the soil, with the ashes upon it, so as to mix all together.

The farmer here saves half the expence of his seed corn. For one half the quantity that is allowed to other lands, is sufficient for these, after burnbaiting, and the crop will be very abundant. It is most profitable to sow wheat the first year; and 'tis best to sow it very late: the first week in November is soon enough, and this way it will flourish and yield a vast abundance.

Few can conceive how profitable a method of dressing it is. What should recommend it the more strongly, is, that it is not to be used on lands which are good in themselves, but on the very poorest and worst, and never fails of success.

It should never be practised on rich soils; nor is it proper on stony, gravelly, or chalky: or indeed for any lands that have been kept long in tillage. The proper use of this method is, for poor, barren, rusty, and heathy grounds, that have lain untill'd, and are of little value.

The farmer is here instructed perfectly in the art of obtaining an excellent crop from the most worthless land.

The advantage will very well last three years, and in that time

time it is easy to obtain, from such a piece of ground, as much in clear profit as would have purchas'd it at the full value. The husbandman is content with this, and he leaves the land as he found it: for the effect of burnbaiting does not last more than the three years; and at the end the ground is full as poor as it was before. This forced fertility has indeed so thoroughly exhausted its new strength, that it will not be fit to bear any thing afterwards, till it has had a rest of ten or a dozen years.

Though the farmer is content with this three year's profit, there is no necessity he should be so, nor are his advantages confin'd to that time, unless by his own indolence.

Burnbaiting, and dressing with dung agree in this, that they both render land fertile for three years. The difference is this. At the end of the three years fertility from dung, the land is ready to receive another dressing; but in the burnbaiting way it is not.

But if it will not receive dressings at the end of three years, they should be offer'd to it in the mean time. It will receive them if they be; and here lies all the secret.

Dung raises but a moderate fertility, and is used to land that was not bad before. Burnbaiting is employ'd on land that was good for nothing; and it gives, the first year, a prodigious encrease. It might bear recruiting after this; but after two years more being exhausted, without any supply, it will not. It is then too much impoverish'd to receive good from any thing, like animals after too long an hunger, that die when they have had food.

We shall propose a method to the farmer, by which, having recover'd such a piece of ground from barrenness, he shall keep it good and fertile for ever.

After the first crop is got in, let him prepare the ground for the second by common manure. This will be readily received; and by this it will be brought to the condition of other land, and may be treated, in the same manner, as a better soil for ever; in the common methods, and with the common advantages.

If marle can be had let the recovered land have a middling quantity of that laid on it, between the first crop and the second sowing. This will be extremely worth while, for after this it will be at once in the condition of other marled lands; and being treated like them, will yield for a continuance in the same manner.

If marle cannot be had, a common dunging will do; or

a compost made of horse dung, cow dung, and river mud.

Tho' burnbaiting is a dressing only needful to the worst of soils in the full extent and degree; yet there is no reason others which do not want it so much, should be wholly denied the advantages of the practice.

We see ashes are an excellent manure; and the heat which is given to the earth, by the burning small quantities of vegetable matter upon its surface, is a great improver of its fertility. Ashes may be a very proper manure for lands that do not require absolute and thorough burnbaiting; and if we give them heat at the same time, it will be still better.

The farmer will do well, on many occasions, to make those ashes upon the land, with which he intends to manure it; and he will thus have the benefit also arising from this heating of the ground. As this does not require the absolute burning of the baite, or turf itself, I shall distinguish these dressings by the name of bastard burnbaiting.

CHAP. XL.

Of bastard burnbaitings.

THESE methods of dressing land have been in practice in many places, and in all ages, though not distinguished by any particular name. It might have been said the practice of burnbaiting is as old as any thing we know of husbandry; the poet Virgil is quoted by every one, for describing it; and all the Roman writers on country affairs have named it. If we take in these bastard burnbaitings, the assertion is more just, and the practice may be said to have been not only antient, but universal. Some of these speak of burning the soil itself: but they all talk of firing its produce upon it, such as dry stubble, and the like; as also of burning other matters upon it brought thither for that purpose. These practices are what I call bastard burnbaitings, which term comprehends the burning the refuse product of the land; or whatsoever is brought to, and laid on it for that purpose: the burning any thing except the turf, which in true burnbaiting is cut up for that purpose.

Ashes are a good manure; but they are of ten-fold value when made upon the land. Men seem to have been instructed in this practice as it were by instinct, for they have fallen upon it in places where they could not have been taught by one another.

In Ceylon they burn off the dry'd stalks of their harvest to prepare the land for a next year's crop : and in America the natives used to spread dry wood over their lands, and set it on fire by way of cultivating the ground. The ashes fell pretty regularly this way ; and the ground was well and uniformly heated by the fire, so that it could not fail of yielding a good crop ; and this, as it was not so severe a practice as burning the turf, would not be of that ill consequence to the land for future years.

Where wood is plentiful enough, there cannot be a better method than thus spreading dry small wood over a stubble field, and burning that and the stubble together. Let us not be ashamed to learn even from savages, when their practice is founded upon reason.

We may consider this general practice of bastard burnbaiting under four heads, as it regards, 1. The burning of sedge on wet lands. 2. The burning the stubble upon corn fields. 3. The burning any waste product on heaths and commons ; and, 4. The bringing on materials to the land, and burning them there.

The burning of sedge on wet lands is an old practice. In these places the grass is short and sward, and there grows a kind of low flag ; whose leaves take up more room than the grass. These are usually yellow, and in October they become dry and strawy. They then cover the ground so, that there is scarce any grass to be seen, and they are dry enough to take fire.

The farmer is to take the advantage of a very dry and moderately windy day, and set fire to a whole edge of the field, that the flame may be carried before the wind. The ground will be thus cover'd with flame, and soon after with a kind of light black ashes. He is then to wait for the first shower to damp them a little, and immediately upon this to sow the whole ground thick with hay seed.

It often happens that the winds take off the whole quantity of the ashes from the ground, but even then the advantage is not lost, for the heat arising from the burning, has killed the roots of these flags that lay just at the surface, and has prepared the ground to receive the seed, which soon takes root, and overpowers any other growth : in spring it shoots up at once, and grows immoderately. There never fails to be a good swarth from this practice, however contrary the season may have been ; but if a little rain fall, and the ashes
are

are well wash'd in with the seed, the sudden shoot is surprizing; and the weeds never recover themselves.

In *fen lands* where the ground is spongy, and cover'd with rushes, they turn up the turf with a breast plow, and burn it on the soil, afterwards sowing hay seed instead of corn. This is absolute burnbaiting, only as grass does not exhaust land like corn, it has not the disadvantage of impoverishing it in that manner for many years after. This will continue good pasture ground a great while without any other care.

It is a needful practice in such grounds, because their wetness is not to be corrected by a mere burning of the sedge; and rushes are too firmly rooted to be destroy'd by that slight method. In the isle of Ely where this light flag over-runs the surface, I have seen the practice of firing it without stirring the ground, used to very great advantage; and though begun there but a few years ago, and only in one particular place, it is becoming universal. The advantage procured the other way is greater, but this is easy, and it satisfies the farmer.

The burning stubble upon the fields is a common practice, and though the ashes made this way are light, and but small in quantity, yet the heat given to the ground, makes such a dressing better than the laying on four times the quantity of the best ashes brought from elsewhere.

This practice succeeds excellently upon those lands that are used to feed the straw, and starve the ear. The farmer finds some lands that yield a full stalk, and a poor ear; and others that lengthen and fill the ear, while the stalk is short. He cannot tell the reason of this; the burning of stubble upon the worse of these lands, brings them into the condition and nature of the better.

When the farmer intends to burn his stubble, the first thing should be to plow up the land under the hedges; for it has often happen'd, that by the wind the flame has been driven to the hedge, and catching hold of decay'd branches, has done vast mischief.

Tho' we have not recommended lime with the ashes made by right burnbaiting, yet for this purpose a sprinkling of lime thrown among the ashes all over the field, and the whole plow'd in after it has lain to stake with two or three showers, is a prodigiously rich manure.

The benefit of burning the waste and useless product upon commons is very great. Stub up the broom, heath, or

other waste matter, and pile it in little heaps, throwing over it what earth has been rais'd in the getting at the roots: these heaps being all prepared, are to be set on fire in a still day, and left to burn to ashes. The earth that is thrown upon them is well calcin'd by their burning, and though reduced to a state in which it would not be fit singly for the growth of plants, it becomes an excellent manure.

Nothing need be done to these ashes till they have lain to be drench'd a little by the wet. They naturally fall in regular heaps. When they have been well wetted, the husbandman is to spread them in a dry and still day over the land; and then the sooner they are plow'd in the better.

Lime is a fine addition to the mix'd ashes made thus; but it is a manure that does not agree with every soil. The ground in these heathy and broomy commons is sometimes clayey; and sometimes light and hollow. When it is clayey, the method now describ'd is to be used without farther addition, for lime will never do well upon clay: but when the soil is light, let the farmer lay upon every heap of ashes, half a bushel of good stone lime; and then let him leave all as before for the rains to damp the ashes, and at the same time slake the lime: after which let him spread them as before directed, and plow all in.

A great deal in all these improvements is left to the discretion of the farmer: if he do not suit his manure, and his manner of using it to the particular soil he has to work upon, he will do nothing even with the best materials, and the most indefatigable industry.

These bastard burnbaitings are only a slight imitation of the real, and though they may, to save expence and trouble, or to suit particular circumstances, be used instead of the perfect method, they never succeed so well. There are cases where the right burnbaiting is not proper; but wherever it is, though the cost be greater, the consequence makes amends. The last mention'd case we particularly except, for the lime here is a very material part of the dressing.

When this method has been carefully executed, the effect of the ashes, the calcin'd earth, and the lime, together with that of the warmth given to the earth itself about the heaps is such, that scarce any other succeeds so perfectly.

It is an easy and a cheap practice. It takes effect upon the most barren soils; nay, it is best of all suited to them. What would the considerate husbandman wish more? or why should not every land owner who has such grounds, put it

it immediately into practice. He need not make the least doubt of a great return.

Last place we are to mention that kind of bastard burn-baiting by bringing sticks, stubble, haulm, and other waste stuff upon the ground, and burning it to ashes. Many have supposed this practice did no more service, than dressing the land with wood ashes; but they are greatly mistaken. The heating the earth in such a degree as is done by the making small fires upon it, we see is a great assistant to its fruitfulness; and this makes a great difference between one and the other of these two practices. In this matter the savages of America are better directors to the English farmer than the common writers. They dress their land with ashes, but 'tis always such as are made upon the spot, so that the land has the advantage of the heat.

If any one doubt whether there be this good quality in heat, let him observe the effects of the two last mention'd burnbaitings. In the other, care is taken to mix the more improv'd part of the soil with the less, and consequently all is equally fertile. But in these two last the ashes, alone, or mix'd with lime, are sprinkled and plowed in, but nothing else is done. Now let the crop upon either of these lands be regarded, and the observer will find, that although the whole field be fertile, yet there are here and there round spots on which the corn is fairer and finer than in the rest. And when he examines the matter strictly, he will find that these are the spots on which the several heaps were burnt.

The ashes made by that burning have been carefully spread; and they have not been more abundant in one place than another: to what then is this particular fertility of these spots owing? it is to the heating of the ground under and about those heaps.

Let this instruct every farmer who intends to dress his corn land with ashes, to burn the materials upon the place. Practice shews, that the lighter these materials are, the more fertility there is in the ashes. Now the stuff burnt on these occasions is much lighter than the common billets used for firing. This therefore is some advantage, but the heating of the ground is a much greater.

Although the perfect burnbaiting of lands has on many occasions a greater effect than any of these superficial and imperfect imitations of it; yet the farmer will find his account in these.

The perfect burnbaiting is proper only for certain soils. These several different flighter imitations of that excellent practice have been laid down to suit it to others.

The farmer will see in what manner, and on what occasions he is to employ them: and he may have this comfort in the use of them, that when he can only employ the flighter kinds, his lands have not occasion for the more perfect: and though additional encrease be less, the expence also is less which procures it.

End of the SECOND BOOK,



A

COMPLEAT BODY
OF
HUSBANDRY.

B O O K III.

Of the Improvements of Land by Inclosing and Draining; and of several Kinds of Fences.

CHAP.

1. *Of the great Advantages of Inclosure.*
2. *Of the more particular Benefits of Inclosure, and the Objections against it.*
3. *Of the several Kinds of Fences.*
4. *Of Ditches, and their Use in Fencing.*
5. *Of draining in general.*
6. *Of draining boggy Lands.*
7. *Of draining fenny Lands.*
8. *Of draining flat Lands near great Rivers.*
9. *Of the Ordering of Saltmarshes.*
10. *Of Hedges.*
11. *Of raising the Quickset, for a White Thorn Hedge.*
12. *Of making the Hedges.*
13. *Of the Seasons for Planting, and the Choice of White Thorn.*
14. *Of keeping the Hedge in Order.*
15. *Of the Plashing of a Hedge.*
16. *Of the Profit that may be had from Hedges.*
17. *Of the Sloe, or Black Thorn Hedge.*
18. *Of the Furze Hedge.*
19. *Of the Holly Hedge.*
20. *Of the Elder Hedge.*
21. *Of the use of the Crab, Sallow, Alder, and Bramble in Fencing.*
22. *Of the Bank Fence, with its Plantation.*
23. *Of the Wall Fence, with its Plantation.*

The INTRODUCTION.

Of inclosure in general.

HAVING given the husbandman instructions for understanding the nature of his soil; and enriching it by manures; we advance to an improvement of another species; that which is made by inclosure. This is not only great in itself, but is the best assistance to the other kinds.

If it be said, this respects the land owner, rather than him who rents his ground, it is the purpose and design of this work to instruct both: nor is it possible to form a wish more advantageous to this kingdom, than that the possessors of land, would join with the husbandman who rents it, in this great undertaking of improvement.

But though inclosing in the first instance may more properly be said to regard the landlord, it is an article of great concern also to the farmer. He is to keep up the fences at a considerable charge.

The benefit of inclosing is so evident, that those who have for other reasons written against the practice, allow'd it the greatest improvement of particular estates. It increases the rent of land in a very important manner, bringing it at once to three or four, and sometimes to ten times its former price.

Every instance I have seen of it, has join'd to enforce this general account: no attempt in that way can be named, that has not enrich'd the owner. One would wonder, a thing so plainly beneficial, is not more universally practis'd.

In private estates some contain more, some less of enclos'd, and of common field land. England is suppos'd to contain more than forty millions of acres; and about one third part of our land is open field. On this supposition, the rent of more than fourteen millions of acres of land in this kingdom, may be now rais'd to three, four, or many more times its value, by inclosure.

Almost every private estate is more or less concern'd in this, as a part of the general quantity: it becomes therefore every land owner to consider it deeply. If he can this way treble the rent of some considerable part of his estate without injury to any person, surely it is worth his while to do it.

It

It has been said inclosures are against the laws of God; and some have imagin'd they tend to oppress the poor; but these points have been debated as their importance demands; and it has been shewn, that if every acre in this kingdom were inclosed, it would be for the advantage of the poor as well as rich. However, let humanity in this case be the guide to every particular person; since what might upon the whole be a publick benefit, may in some cases be a private crime.

Let the land owner who is about to inclose, consider the consequences in that particular place: if it appear that many are to be injur'd by that which singly enriches him, he ought to decline the undertaking: but these certainly are circumstances that cannot often happen.

C H A P. I.

Of the great advantage of inclosure.

EVERY land owner is more or less concern'd in this article of inclosure, in proportion as more or less of his land lies open; but it will be objected by many, who see the advantages, and have land enough to improve, that in some places the soil is so bad, it is not worth the expence; and in others, that as the lands have lain open from time immemorial, the common people will not suffer it.

Every objection ought to be answer'd. Those made against the general practice, have been already taken notice of; and it is fit these should be consider'd, which regard particular attempts: the general practice must be begun and carried on by particulars; therefore they ought to be satisfied where there is ground to do it.

The barrenness of the ground is a very common and a very natural objection; but it is not just. A great deal of land is called barren, that would have a better character under right management. Nine-tenths of the land in England that is called so, might be cultivated with great profit.

Every thing may be cultivated except hard rock, and of that we have very little. He who shall think it worth while to undertake the improvement of the worst of soils heartily, and shall begin with enclosure, will give his descendants cause to bless those who set him on the trial.

Let us turn our eye upon those tracts of sand which cover some parts of Suffolk, and the edge of Norfolk: nothing call'd a soil, can be so barren as these, and yet they are

are cultivated, where people have spirit and resolution, to a fair advantage.

In some of these places the surface is a naked sand. There is no mixture of earth to be seen in it; and no weed, not so much as a blade of grass to be found upon it for miles. In the open places it is moveable, like the sands of Arabia, by the winds; and is carried in great quantities, like waves, before every hard gale. No wonder nothing grows upon it; for this single circumstance must prevent that entirely.

Nothing can be pretended to be more barren, except bare rock; yet they find the way to render this fertile. They soon hay seed upon it in a calm day, and immediately cover this with furze-bushes, which they stake down, to prevent their being blown off. The covering not only keeps the sand steady, but produces some moisture, as there will be on all ground that is cover'd. This softens the seed, and it soon shoots. After a little time the roots spread, and intangle in their natural way, and hold down both themselves and the soil, till it be cover'd with a tolerable sward, and fix'd from the motion it had before.

Tolerable pasture is thus produced out of the most absolute waste. We propose these things for the farmer's imitation, and improvement. The owner may see from this he needs not suppose any part of his estate barren, from this fault; and we shall shew how all others may be remedied, and how most of them are remedied in one place or other.

He who undertakes the practice of husbandry, upon this plan, will not stop at what he has seen done by others. He has seen what may be done in the improvement of soils, and for what they are suited; and upon these principles he will turn the Suffolk method to a much greater account.

Let him who has such a piece of ground, begin as they do there, but let him not stop where they do. When he has cover'd the sand with a sward, let him enclose it with a thick hedge, to prevent that from the neighbouring ground being driven upon his crop, and burying it.

Let him also consider, that when he has a piece of sandy ground enclosed, grass is not the only produce it may yield. Carrots thrive better in this, than any other soil; and turneps will succeed very well.

These are two articles by which he may pay the expense

of his inclosure, in a few years, and all that time be improving the land. But that is not all.

We have shewn in what manner sandy soils may be brought into a condition to bear any crop to great profit, and with great certainty. What will improve and enrich a sandy soil, which has some mixture of earth, will, in a fuller use, give fruitfulness to this bare sand itself; this follows from the nature of the practice, which consists in adding such matters as alter the nature of the ground.

As soon as the owner has been at the expence of an inclosure, let him not depend upon hay, which is little, or upon the pasturage it will afford, which, though very sweet, is also moderate in quantity.

Let him begin to improve it by the methods laid down before; and when he has by careful management brought it to the condition of a better ground, let him sow it in the usual manner. He will reap wheat, barley, rye, beans and pease from it, to the astonishment of his neighbours, and perhaps to their imitation.

This is no way to be undertaken but by beginning with inclosure, the expence will be something; but a few crops will repay it: and the land will be render'd valuable for ever.

As this may be done by inclosures in the worst soils, upon a better land the advantage will be greater. What is proposed here was to answer the objection, that some parts of an estate may be not worth inclosing; which is thus shewn to be a mistake.

The benefits of a perfect and expensive dressing of land, are never thoroughly secured to him who is at the expence and trouble, but in lands that are inclosed. This therefore is a great motive for extending the practice.

As to opposition, where the inclosing will be a real injury to the poor, the landlord has been already advised to let it alone; but this can happen only in a few instances. In all others, where their opposition arises from obstinacy and folly, let him guard against its effects by setting out in a proper manner.

Dry hedges are easily laid flat, and quicksets pulled up, let him make his fence by a ditch seven feet deep, and as many wide, and prevent their throwing in the earth, by spreading it as it is thrown out, upon his land. This will serve as a manure to the soil, and though passion might have led the mob to throw in the bank if it had been left, they

they will not be at the pains of digging for that purpose : they cannot have opportunities of doing this in secret, and they will not dare to do it openly.

Thus the effects of malice will be prevented ; and the benefit of the expence and labour assured to the proprietor ; if water can be got into the ditch, the better. After a few years, things will be left quiet, and a quick may be planted, which will thrive leisurely, and ensure all the advantages of a regular inclosure.

CHAP. II.

Of the more particular benefits of inclosure ; and the other objections made against it.

THE improvements mention'd in the preceding part of this work, are very numerous, and great. The least of them will answer the expence of the most costly inclosure, in the compass of a few years ; and there is no kind of land whatsoever, but will by that means be render'd capable of one or other of them.

This sets the business of inclosure on its proper footing, shewing the land owner, in every situation, that it is his interest to inclose. It is a bold thing to advance, but it is as certainly a truth, that no person ever set about inclosure upon proper knowledge, who did not vastly profit by it.

It not only makes land yield greatly more ; but it prevents trespasses and injuries which are continually happening in common lands.

It gives a liberty also of making whatsoever alterations or improvements he shall choose : he may plant and sow what he pleases, and in what manner he please ; which he cannot do without a thousand insults, interruptions, and inconveniences, from the malice, envy, or folly of his neighbours, while it lies open.

We read of inclosing as the next thing to plowing ; often, in more improved times, as prior to it : and in all known countries, from the earliest time to the present, inclosed lands have been held more valuable than the open.

Beside the political advantages of inclosure, in securing the fruits of a man's industry, there are several that may be called natural. We have mentioned the use of hedges in those sandy weilds of Suffolk, to keep off loads of the loose covering of the barren parts, from overwhelming the fruitful : but beside this, they are of great service to the
crop,

crop, of whatsoever kind. They defend it from winds, and, from those cold and nipping blasts which are so mischievous in the early part of the spring. An inclosed piece of land is always warmer than a piece in an open field of the same soil and condition.

Inclosure preserves the natural heart of the land, and that richness which may be added to it by proper manures. The same quantity of manure will do twice the service upon a quiet, warm, and sheltered close, than it will upon an equal quantity of ground in an open field, where it is liable to all injuries. An inclosed land yields a much larger crop of any kind of corn, from the same seed and the same dressing, than the same quantity in an open field : and as to the grass, there is no comparison. The hedges also, if rightly managed, are, in themselves, a great profit. They serve for a shelter to the cattle ; and supply wood for all necessary purposes ; and they may be made in many places to yield valuable fruit.

These added to the other benefits arising from enclosure, we hope will lead all to a due sense of its importance. Nothing more is wanting to convert the naked and starved parts of Wiltshire, Hampshire, and our other counties, into the same condition with the most rich and improved parts of Buckinghamshire, and Hertfordshire ; and to make the common people of one as happy as those of the other : for whatever pretences may be made of the oppression of the poor, by enclosing, they no where are so happy as where the land, in general, is under inclosure, and no where so miserable, poor, ragged, and idle, as in those places where most of it lies in common.

All was originally open : the civilizing of people, and improving lands by inclosure, came together. Those who first settle in a country find it all common : they, by degrees, appropriate and inclose : and why should not that which is found so beneficial in the first steps to improving a country, be carried throughout.

Every man would wish, to have his own entirely secure, and this can only be by inclosure. That land cannot be perfectly a man's own, which is not entirely in his power. And that is not in his power which he cannot manage as he pleases ; where the profits of his labour and expence are not assur'd to him ; where every stray beast from the highways and commons, may walk in and tread down his crop : nor can that land be said to be perfectly

fectly under his management, which he is obliged to sow and reap at the time others do, when he knows how, by another conduct, to have greater profits.

What is urged here in favour of inclosure, is not from fancy, for we see daily the effects of that practice. Let us direct our eyes to places where, in the memory of our fathers, inclosures have been made from the common fields; and examine together the condition of what is inclosed, and what lies common. The land is the same, an hedge only parts it: yet we find universally, the crop is greater in the inclosure, than in the common fields: nor can there be any cavil against the conclusion from this, by alledging that more is bestowed, in dressing the inclosed piece of ground; for 'tis plain, by peoples continuing to dress it at such expence, that the profit answers. The general and unanswerable argument is, that inclosed lands are of more value than equal quantities upon the common field. This is so plain an argument that it admits no dispute.

We see vast quantities of land lie open, where it is of little value: we have seen, from time to time, parcels taken from this and inclosed, which, upon due dressings, have, in a few years, paid back all the expence of inclosing and improvement. Can there be any reason assign'd why this should not be done every where?

The reasons that have been pretended against it are either false or frivolous. Many of them have no foundation in fact; and others which are true, and make a general grievance, may be easily removed.

It is not true that the poor would be injured by a general inclosure: if there be particular instances, amends should be made to the sufferers. The advantage that a poor man has by keeping two or three sad creatures of cattle, of any kind, upon the common land, are not nearly equal to what he and his family would find; by being sure to know where to get constant employment as labourers. The privilege is indeed a source of idleness: and that can never be for private nor publick advantage.

Upon the edges of great commons we see a miserable set of cottagers. Hunger is in their faces; and misery upon their back: they idle away their time in tending their own and other people's cattle; and breed their children to this poor employment. The profits are not comparable to what they would have from the usual price of labour: if these
lands

lands were inclosed, they would be compelled to industry; and always found in employment.

The number of claims and titles for every piece of common field and waste land, is indeed likely to be always an hindrance to inclosure. Among several people one man is obstinate, and will not comply; another is under age and cannot: these are real objections, but they may be removed.

Is what has been said upon this subject true or false? certainly it is true! being true, is it not sufficient proof of the general and universal benefit of inclosure? if so, why should not a power be allowed to the majority of proprietors, by parliament, as in other cases, to which the few who are foolish and obstinate, must submit? In virtue of this, a liberty should be given to some to treat for minors; and in all particular cases provision made for those who shall fairly shew themselves aggrieved.

This appears to be a reasonable plan: and the consequences of it are certain. They are a great addition to the value of land; and a constant employment for the poor and industrious. The highways, which are at present so wide in these open fields, and destroy so large quantity of the land, might be reduced, and no prejudice to any could arise from it there, any more than elsewhere. A great deal of land would be thus recovered from the most needless waste imaginable; and its value would be made greater.

As inclosing land any way is an advantage in every place, the smaller the inclosures are, the greater is the improvement. Inclosures of a large extent are less sheltered by their hedges, and have less of all the other benefits, as they approach nearer to the nature of common fields. And, on the contrary, the more of these inclosures are made, and the smaller the parcels of land contained within them, in the greater degree it has the benefit of that practice.

The encreased value of land keeps pace with these advantages: the same quantity, upon the same soil, will always let for a larger sum if there be many, than it will if there be few inclosures; that is, it will fetch the more rent, the more it is divided. Objections might be started, from particular instances, and such will be consider'd severally hereafter: this is said generally; and it has fewer exceptions than almost any other general rule.

In meadow land there is sometimes a loss by too many hedges, from the quantity of grass they spoil by their shade,

shade, and drippings ; but this disadvantage is owing to the want of knowledge in fencing. We shall shew, that in these cases, if proper trees are planted, their produce will be worth more than the grass they injure.

Objections have been started against inclosure in corn lands, from a common opinion that wheat is more subject to blasts and mildew in inclos'd lands, than in the open fields. Of this we shall treat at large, when we speak of the distemperatures of corn : for the present it is sufficient to say, that these accidents are not the effects of inclosure. We shall, hereafter, shew their nature and their cause ; and propose such methods as will not fail to preserve the crop. Wheat is as liable to blast and mildew upon an open field, as in an inclosure, provided the land be as rich ; and as there are methods of prevention in each case, there is not the least justice in using this accident as an argument against inclosure.

It is said, the number of labouring people is not sufficient for dressing all the lands in the kingdom, if they were all inclosed. Let this be fairly consider'd, for it has some weight. The same quantity of well-inclosed land demands more workmen than when open. The cause of this is from the different culture of inclosed and open fields ; in the fallowing of one, the constant working of the other. But this is a great argument in its favour. All the land of the kingdom could not be inclosed at once ; so the labourers would not be all wanted at once. They would rise as the occasion rose for them. At present all other employments are over-burthen'd with numbers. Tradesmen starve from the multitude in every business. A better application to husbandry would take off these redundant traders, and would those multitudes, who, because they cannot get bread at their professions, rob and steal.

These are all the objections that have been made to the inclosure of lands ; and every impartial person will judge, whether the answers be not satisfactory.

General rules cannot suit all particular cases ; therefore he is not to go to work rashly, on seeing the utility of the plan, but to follow us, step by step : we shall shew him, that though all inclosure is profitable in all places, yet the inclosure of meadow land is one thing, and of corn land another ; with the reasons of this difference, and the conduct he is to follow.

'Tis said there are lands which cannot be inclosed, because

cause trees or shrubs will not grow upon them, but we shall shew, that ignorance is oftener the parent of this excuse than knowledge. That all trees are not suited to all soils, every one knows : but there are some suited to every kind, and these such as may be work'd into hedges. Where trees will not thrive, there are other kind of fences to be made ; and, in general, nature, in those very places where she denies growth to the one, has made provision for the other.

There is no land that may not be inclosed by some fence or other, with profit to the undertaker. The methods will come next into consideration : the suiting the fence to the land, and the making and preserving the several kinds.

C H A P. III.

Of the several kinds of fences.

WE have said every kind of ground will not admit of every kind of inclosure : but that there is no land that will not bear some.

Where the soil is too barren for the growth of an hedge, there is often stone ready, for a wall : and where it is too damp for the thriving of those shrubs, which usually are planted for that purpose, the water will fill ditches.

The first thing is to examine the nature, soil, and situation of the ground to be inclosed. There is choice enough of ways to do it ; and a prudent election must be made among them.

He who should plant hawthorn in a fenn, or dig ditches on a sandy hill, must be disappointed. One will rot, and the other be fill'd up. Neither can they at all answer the purpose. But that is no proof inclosure, properly conducted, would not have succeeded.

But meadow and pasture grounds fall within the reach of this great benefit. These last are distinguished by the degree of moisture. Those which lie low, and within the reach of natural or artificial overflowings, are called wet meadows or pastures ; and those which have a higher situation are called dry meadows, or, more commonly, dry pastures. Some confine the term meadows to the wet, and pastures to the dry ; but this is not the usual sense of the words. Beside these there is another kind of meadow, or pasture ground, which is damp or wet from its own nature, not from the accident of being overflowed, at times, by rivers.

vers. This, when it is the wettest of all, is what is called bog.

These are the three great differences of meadow or pasture ground: and according to these the lands are to be enclosed in several manners.

In the dry pastures hedges are the proper fences. They are of great service; beside their sheltering the cattle, they defend the grass from the summer heats, and shelter it in the spring from the drying winds. For this reason, the smaller the inclosures are in dry soils, and on hilly situations, the better the pasture thrives. This may be seen in the hilly pastures of our improved counties. All is fresh in these small closes, while the grass is poor, sparing, and burnt up in the opener pastures. The hedges also are of value for their produce in useful wood.

The wet meadow requires choice in the shrubs for the hedge, and such as are proper thrive so fast, that the profit arising from them is very considerable: in these the inclosures need not be so small; for lying low, and being well water'd, they are better defended in their own nature both against the winds and sun.

For the last or wettest kind of pasture land, ditches take the place of hedges. They easily fill with water, and are a very safe fence. Beside that, if well contrived, at the same time that they inclose, assist in draining the land.

Thus a proper regard being paid to the nature of the ground, fences may always be had. The quickset hedge will thrive in many places, where few imagine: this requires a degree of knowledge the generality of husbandmen have not; but which we shall endeavour to convey to them in the plainest and most familiar manner. In places where the hawthorn will not thrive, there are other shrubs that will make a good fence. Where nothing of this kind can be used, the earth yielding stone, walls may be built at a small expence; or it abounds with water for ditches: and where none of all these can be had, banks of earth may supply the place, and will answer the full purpose. He who is inclined to inclose, can never be at a loss for a fence. We shall inform the farmer of the proper fences for all kinds of ground; and of the best methods of making and preserving each.

CHAP. IV.

Of ditches, and their use in fencing.

HAVING enumerated the several fences, and the lands to which they are most suited, we come to the particular consideration of each. Ditches are the most cheap and easy of all: and they lead to the making the others; and to that very considerable article, the draining of land. From these we shall advance to the quicksets: thence to the plantation of trees in hedges, and from that to their plantation in coppices and forests.

Fencing by ditches is the least expensive of all the kinds; the soonest made, and the easiest to keep in repair: but it is only to be done in wet land. Where there is plenty of water, the inclosure cannot so well use any other kind: but let him be sure this is the case; for he who should dig ditches, and not have water for them, would throw away a great deal of expence.

He must examine not only whether it be wet and damp, for that many lands are at certain seasons, or by accident; but whether it be naturally and constantly so at a due depth. Let him see from what source the wetness arises, and whether this be continual; or of such a kind as will afford a sufficient supply of water for the filling ditches.

If his neighbours have ditches, let him observe their state and condition; and see whether they answer their purposes. If he finds they do not, let him consider why: if they do, let him see whether such will be likely to answer his purpose in the same manner.

If ditches have been used long in the neighbourhood, and yet do not succeed well; let him examine whether the failure be owing to nature or neglect. Whether they have not been dug too shallow; and whether they do not fill up by weeds, or by the swelling of the soil; which in boggy ground is frequently the case.

If it appear that their imperfect success is owing to any natural cause, let him not attempt the same kind of fence upon his own ground: if there be not a supply of water, all his art cannot in these cases bring it.

If he find the bad success owing to ill management, let him learn better from their errors, and by avoiding them in his own work, assure himself of that success which nature allows. If the fault be in digging them too narrow, or too

shallow, let him make his broader or deeper ; if in preserving them, let his care be doubled. Did theirs succeed at first, but afterwards fail when choaked up with weeds ? let his be kept clean always : and in the same manner let him avoid other mistakes.

If he find the ditches succeed well on his neighbours land, let him, before he sets to work, examine strictly whether his own ground be of the same kind : for often fields that lie very near, differ greatly. The fen lands in Lincolnshire, Northamptonshire, and the isle of Ely, terminate abruptly. Ditches are the only fence they have in many places on these lands, but he would be strangely foolish who should attempt the same fence when out of their district, though ever so close upon the edge of it ; only a careful observation is necessary, however, to determine this ; for, though the two lands lie ever so close, the difference is palpable.

If there be no ditches by way of fence in the neighbourhood, yet the land seems by its likeness in soil and situation, to those where they are used, to be fit for them, let him examine carefully where holes have been dug by accident, or with other design, whether water comes into them, and remains in them. If he find it comes in naturally and freely, and remains there tolerably well, let him set the example by a fair, though not large trial ; if it succeeds, he will continue it himself, and lead others to imitate it in larger works.

Where the land lies flat, when it is wet below, and the water that stands upon it, becomes foul and reddish ; where the soil is black and mellow, and shakes or moves under the feet in walking, there is generally water for ditches, and these are the proper fence ; for there is neither stone in the ground for walls, nor has the earth a firmness for banks, neither will a quickset grow there. Nature in these cases shews the incloser what he is to do, for she leaves only one thing that he can do. He is to dig those fences which he can neither raise nor build. Beside the cheapness of the work, the soil cutting very easy, what is thrown up is of use ; sometimes more, sometimes less, according to its nature.

In large commons these ditches run into one another ; or all the lesser into one larger, which at length communicates with some other water ; but in this case the water is apt to grow foul quickly, in the lesser ditches especially. The best situation is where every ditch can be carried strait down to some river. There the water is more constant, and is always sweet. These may be bank'd upon occasion with their own
 3 earth ;

earth; and if there be any danger of the cattle from one pasture, getting into another by wading over the mouth of the ditch, no more is necessary than the running a rail along on each side into the river, to a certain depth, and they will never attempt to swim round it. This is the practice all along the river Nen in Northamptonshire.

In marsh land in general this fence does as well as any; and in many cases it is greatly preferable to any other. About six foot is a proper width for these ditches, and they should be about seven in depth, that there may stand four or five foot water in them usually; that in droughts there may always remain some, and that they may hold two or three foot perpendicular more in overflowings, without running over upon the land.

When a fence of this kind is made, a little care will preserve it, but that care must be used, otherwise it becomes presently over-grown and useless; or the weeds cover it so thick, that cattle attempting to walk over fall in, and are not able to get out again. This is a common accident on the careless peoples grounds in the isle of Ely, but it seldom happens where things are better regulated. Weeds are apt to grow in still waters; and the soil is so soft, that the banks and edges of the ditch are soon broke, and spoil'd: but in the worst of these places, when the ditches are properly clean'd, the accident scarce ever happens. When the water is clean, and the bank steep, there is hardly any such thing heard of as cattle falling in.

These fences do not answer the purpose of a hedge in defending the grass from sun, or winds; but the moisture of the earth in those places answers the purpose. And at the time this moisture is too abundant in such grounds, the same ditch which serves for a fence, answers in some degree the purpose of a drain. The water is to stand in the ditch two or three foot below the surface, and in this case the uppermost two foot of the earth is drain'd in a great measure by it, and this depth takes in all the soil.

So much good is to be done in many situations by the ditch fencing alone, that the same ground which lying open is wet and shakes under the feet, will, upon dividing it by a good number of ditches, be render'd firm and sound; and its product in all respects better: therefore in dividing and inclosing land by ditches as well as hedges, the smaller the inclosures are made, the better.

The earth that is thrown up in digging these ditches, is a
P 3 very

very considerable quantity, and according to its nature, or the circumstance of the place serves various purposes. Sometimes the whole, and sometimes a part is requir'd for banking at the edge of the ditch itself. The earth itself is sometimes entire fine mould, and not unfrequently is either a true peat, at some little depth, or is so intermixed with roots, that it will make a kind of peat at the surface. In Lincolnshire they cut it into proper pieces, whether it be of the better or worse kind; and burn it either alone or with dry'd cow dung: and the fine black mould that is dug up is excellent to mix with dung for the manuring dry corn lands.

CH A P. V.

Of draining in general.

LANDS which have occasion for draining, admit no other fence but that by ditching, for they are too wet for quickset hedges, and too soft to bear the weight of walls.

These lands are of two kinds, their difference arising principally from their situation: the one sort lie between hills, or upon some level on their sides, or even on their tops. These are called by way of distinction, bogs, or boggy lands: the others lie in a flat, and often extend upon an exact level many miles. These are called fens and fenny lands.

This is the general distinction; but if the word boggy mean only wet and soft, it is as applicable to many parts of the fens, as to the hilly quagmires, many of these fens being as tender and soft as what are more particularly called bogs upon the hills, or between them.

There is some difference in the ways of draining these lands; and to this is owing the difference of their denomination. The boggy lands have an advantage over the fenny, in that they have a greater descent; and thence arises the difference in the methods: the fenny lands, in general, are less wet, and less rotten.

To understand the draining of these lands, we must know from what the mischief arises.

Bogs are made by springs, which rise at some depth under the surface. Hills naturally give rise to springs: and when these issuing from some depth, meet with a weight of earth that pens them in, they spread under the surface where the soil is soft, and moisten and rot it, till it becomes a quagmire,

mire, cover'd only by a turf at the top, which is continually in a trembling motion when trod upon.

Fen-lands lie on flats, and are nearly upon the level with the water of rivers that run by them : they are subject to be overflowed by the swelling of those rivers. When this happens, as they lie so flat the water cannot get off ; and hence arises the necessity of draining them. There are some fen lands continually wet, not accidentally from those overflowings. These approach more to the nature of the bogs ; and the method of draining them is to be accordingly regulated, partly as that for bogs, and partly as the other.

CHAP. VI.

Of draining boggy lands.

WHEN a piece of boggy ground is to be drain'd we must first find the lowest part ; and observe what descent there is. Then a drain is to be open'd, and it must be cut through the ground to such a depth, that its bottom be at least a foot below the level of the springs. The water from the whole adjacent ground drains into the cut ; and there, provided a free passage be kept open, it runs off.

This single operation, if it be judiciously design'd, and properly perform'd, must effect a cure. The cause of this boggynefs is, that the water of springs is damm'd up by earth ; a passage is here given, and consequently the cause of the evil is removed. The water that swelled and soaked the ground, because it could not get off, has now a way by which it runs out freely and continually ; and the ground which was made a quagmire by its being before pent in, becomes dry enough to be useful.

The great care must be, that the drain be cut deep enough : for if it be not below the bottom of the springs, the remedy will be imperfect. There will still be a lodgment of water in the lowest part of the bog, the drain carrying off only what is above the level of its bottom ; and it is surprizing to see how much mischief a little wet in a land, that has been us'd to be boggy, will do.

The depth is so uncertain, there is no giving any general rule for it : but some guess may be made from the nature of the ground. The way appears greater to the spring than it is, because the boggy land is raised and swelled up beyond its proper surface, by the force of the water that is confin'd in it ; inasmuch that in a bog well drain'd, it will often sink

two, three, or four foot from what was the height while wet.

The depth at which the springs lie, is greater according to the weight of earth that pens them in : but he who sets about this with discretion and judgment, will know whereabouts it will fall, from his observations ; and he must have resolution to go through what he has undertaken, for all will be sure profit in the end.

The drain must be begun in the lowest place, and carried into the bog towards the spring head ; and trenches must then be cut across : by means of these every part of it will be drain'd.

The breadth of the drain must be proportioned to the depth ; the undertaker will be able to guess nearly at the necessary depth, before he begins the work.

Some farther care will be necessary in the draining bogs, for the securing the advantage, and avoiding inconveniences.

When small drains are sufficient, as rushy bogs ; they may be left open ; and no farther care is necessary than to look at them now and then, to see they are kept from filling up. But when they are broader and deeper, some farther precaution is necessary.

The earth thrown out must never be left upon the edges of these drains : if it will serve neither for firing or manure, it must be carried off, to be thrown away ; but generally it is a turfy matter, and will make a coarse fuel.

When the drain is wide and deep, 'tis best to cover it up to prevent cattle falling in. A quantity of rough stones must be thrown in : they should be such as will not settle too close. Upon these is to be laid refuse wood, and over that some of the earth that was thrown out in digging. By this means a passage will be left free for all the water the springs yield, and there will be none of these great openings upon the surface. Care must be taken to keep the trenches clean ; and then this main drain will keep in order for ages.

This is the practice in the draining of boggy lands ; but it is not our intention to leave the practical husbandman, with only the common and general rules to guide him. The best general methods admit of improvement in particular instances.

Though in many places the trenches will keep clean, if the earth thrown up out of them be removed ; yet in some bogs the earth naturally swells so, that they fill up of themselves, though cut to a considerable depth ; from their bottoms rising, and their sides pushing towards one another.

I have seen in Lancashire such strong instances of this, that one might trace the old trenches over the surface of the bog, not in hollows, but in a kind of rough seams rais'd above the level; as the letters carv'd in the grotto of Antiparos, not only fill up in time, by the swelling of the stone, but project beyond the surface.

In these cases the bog remains a bog still. The expence has been thrown away, and the attempt of draining given over: if such discouraging circumstances threaten our undertaker, there is yet no need of giving up the design.

He is to treat his trenches as his wide and deep drain, keeping them from filling up, by throwing in something between that will preserve an opening for the water, and keep the sides asunder.

Let the trenches be cut deeper than otherwise; suppose three foot deep, and two foot over. As soon as they are made, let the bottoms of them be cover'd with fresh cut black thorn bushes: upon these let him throw in a quantity of large refuse stones: over these let there be another covering of black thorn bushes, and then a covering of straw; and upon this some of the earth, so as to make the surface level with the rest. These trenches will always keep open.

We are only bringing the experience of one part of the kingdom to the assistance of the others; and laying before the husbandman of Lancashire, the practice of the drainer in Oxfordshire. This is a well known method there.

Nothing is more easy, nor is there any boggy piece of land where the large drain can be made effectually, that may not be cur'd by this practice. Yet, at this hour, many pieces of boggy ground may be seen in the county before-cited, with the trenches all grown up, and with a deep dirty drain half full of rubbish, which might every one have been thoroughly and perfectly cur'd, by this single and slight expedient.

In Staffordshire, instead of black thorn bushes, they make the first lay of a quantity of fresh heath, and then put the stones, covering them with a good coat of more heath, and then with earth. This is a good method where heath is to be had; for it is tougher and more durable in the wet than the other; and at the same time, though it lies closer a great deal, yet there is something so stubbed in the large shoots, that they will not be press'd entirely flat.

The worst boggy lands that lie upon or between hills, may be drain'd by this method: which is easy, cheap, and
not

not liable to failure by accidents: and it is as certain, the value of the recover'd lands is very great.

To this we shall add a method of making drains, in such boggy ground as is soft and mellow, and but moderately wet.

Several holes must be dug in a strait line along the bog, at about eight foot distance; these are to be seven foot deep, and four foot wide. A man is to get into one of these as soon as it is dug, and to dig toward the next, each way, leaving a coat of earth of about three foot thick at the top. Thus he is to proceed in each hole, till the several burrows meet, and there is a subterranean drain made through the whole bog.

Brush-wood, or any useless materials of a like kind, are to be thrust into the drains every where, to keep them open, and thus the water will be carry'd off with great certainty, and the bog will be left dry and firm land. This method was first invented near Weeford in Staffordshire, and is at this time practised in many of the neighbouring places with a lasting success.

When a piece of ground is first recover'd from its boggy state, it will be unfruitful. Its natural product in this wet condition was moss, and it will continue to yield nourishment to that, and, till assisted by art, to little else. To cure this, it is to be dress'd with ashes. These are to be spread over it, at the rate of thirty bushels to an acre; and they will effectually destroy the moss, and enrich the soil for better products.

C H A P. VII.

Of the draining of fenney lands.

WE are to distinguish such fen lands as are naturally wet at the bottom, from such as become wet by the overflowings of rivers, from land floods, or other accidents; for a different method is to be taken in these cases. In one, nothing is requir'd but the carrying off a quantity of water that has fallen upon them by chance, and stagnates there, because of the flat and level situation: in the other, all is to be done that is requisite in draining of bogs; and these often very difficult to drain, because of their flat situation.

As to these fen lands which are overflowed at times, and have a good soil, if the water could be carried off at pleasure

sure it might be an advantage; for it would only answer that useful practice, the drowning of meadows, if at a good time. The soil of these fens is generally good; but the water does not always come on regularly, nor is it to be got away without labour and expence.

If the water can be carry'd off from the surface of these lands, 'tis all that is requir'd; but in the other case, were the upper part of the soil ever so well drain'd, the source of the wet being within its own bowels, the mischief would return, unless that had a passage: this can only be done upon the principles of draining, as laid down in the former chapter: this is also the best way with those which are only subject to occasional overflowings; for when these have happened often, and the water has been used to lie a great while upon the lands, they are soak'd down to a great depth, and have acquired, by habit of wetness, much the same qualities with the naturally boggy grounds. The carrying off the water lodg'd on them, by land floods or heavy rains, is only a superficial and partial cure: the draining them to the depth, though it may be a more expensive, is a perfect remedy: nor is the other ever to be done perfectly, by all the contrivances that have been made.

The judicious undertaker should, to each kind of land, if it be of any extent, use both methods; for by first throwing off the superficial water, he will be able to carry on his works for a deep and thorough draining, with greater ease and success.

This superficial water may be carry'd off by engines, when in very great quantities, with little expence: the sight therefore of a sea upon the fen, at certain seasons, need not discourage the undertaker from his attempt. I have seen fen lands of great extent, that have been a perfect lake to appearance while overflowed; but, by degrees, a good part of this has run off, and the remainder, which has lain and render'd the ground useless, might have been carry'd away by the most common engines. The general negligence in this case is surprizing. We propose to inform the farmer how he may make a perfect cure, not only preventing the effects of his neighbour's neglect, but rendering the land secure for ever, from either its own wetness, or such accidents.

This complete remedy is to be effected by three things, supposing the land both wet in itself, and liable to overflowings. These are, first, taking off the water from floods; secondly, draining it of what rises from its own bottom; and,

and, thirdly, the preventing its being overflowed for the future.

For carrying off the chance water many engines have been contriv'd; but none answers better than the sail wheel; which they call, by way of eminence, in the isle of Ely, the engine. This is compos'd of about a dozen spokes, fashion'd according to the particular purpose, and is turn'd by sails like those of a windmill.

This engine will carry water excellently either off a flat or where there is some rise; but for this last use there is to be some variation in the make of it. When 'tis only to push the wet along a flat the spokes are broad, and set a little sloping. And 'tis amazing how vast a quantity of water it will thus throw off in a day's time, the spokes all moving between a couple of upright boards, which make a kind of trench for them to pass through.

When the water is to be rais'd to any little height, the spokes are made hollow like so many scoops; and they are set so as to deliver the water just at that pitch, which they do incessantly.

If the water be to be thrown out at a larger height, as over a bank; the spokes are made in the fashion of boxes, which do not throw the water out before them, but take it up, and retain it; letting it, as they rise, run into an hollow circle that goes round them, at about half their length, whence it is discharg'd again from the back of the spokes as the wheel descends.

Thus is this engine suited to all the common purposes of draining: and kept in repair at a small expence. The farmer is right to prefer it to many of the more complicated machines.

When the water of the land floods is carry'd off, the undertaker is to remove that which rises in the land from its own bottom. This he will do with ease enough, now the accidental load is taken away; whereas, otherwise, there would have been endless interruption of his works, and mistakes about the springs.

He is to act in this upon the same principle as in draining of the bog, only as the compass of ground is greater, the works of every kind must be larger.

A main drain is first to be cut; and this must be done with the utmost care, for upon this the success depends. The situation of the whole land must be consider'd for this purpose. And this main drain must be cut deep enough to
carry

carry off the water from the whole level, at the depth from whence it is found to arise : This is often not more than a foot or two below the surface in the lowest places.

The breadth of this drain must be proportion'd to its depth ; nor need the undertaker be under any concern on this head : for supposing all to be absolute refuse that is thrown out, the benefit arising to the land will very well pay the expence.

The depth and width being determin'd ; it is to be carried from the lowest part, as its bottom, to the necessary part of the ground.

It must be widest at the mouth, or opening, and must grow narrower all the way to its head.

If the compass, situation, or other circumstances of the ground require, there may be more of these main drains : and there must be so, where one cannot answer the purpose. In this case they are all to be made as the single one already described ; they are to be carried in a strait course ; to be of a sufficient depth ; and to be widest at their mouths, and narrowest at the head.

When the main drain is finish'd, a number of other lesser drains must be open'd. These must be cut upon the same principle with the great one, narrowest at the head, and widest at the mouth ; and of a proportioned depth.

These smaller drains are to be brought from every part of the work ; and to be carried strait into the great drain, at the nearest place.

The effect will be such as is not to be conceived by those who have not been accustomed to these undertakings. The ground which has been left soft and pappy, from the water just carry'd off ; and which is shaking at every step in the lower places, from its own natural wetness, will, by the continual running off of the water, soon become dry and solid. It will sink a foot or more throughout, if it have been naturally very boggy ; and it will remain firm under the feet, and bear carriages. I have seen lands, on which a horse's foot would break through the turf, and he would be let in up to the belly, become hard enough for a waggon in a little time by this method : and such as would swell and rise, and dance under a man's foot like weak ice, bear a coach over them without motion.

When this effect has been obtained, the care is not to stop : for though the ground thus recover'd may keep good
for

for ever; yet, with neglect, it will soon relapse into its old condition.

Care must be taken to keep the drains clear. In the beginning of October, and about the end of April, they must be thoroughly cleansed from weeds, mud, and other foulnesses, that gather in them, and when they are neglected, soon choak them up.

Care must be taken also, to prevent the mischief of floods. The water brought on by those, could not now remain upon the ground, because of the service of these drains, but it would in running off, tear and destroy the works; and would entail an endless expence upon the undertaker.

Let him examine in what place, and from what source these waters came on. If the inundation be from the overflowing of a river, the business is to bank out that river in a proper place, leaving it ample scope for its course, but just keeping it off the ground. If it come from the high lands, care must be taken to give the water a vent into the next river, to prevent its falling upon the lands: this work will require in some places more, and in some less expence. In some situations it is impracticable, and then the drains must be trusted to: but where it can be done within any moderate price, it is always worth while; for the recovery of so much land under a certainty of its continuing good for ever, is an article of vast importance.

In some fen lands the remedy is easy, in others more difficult, in some utterly impracticable, within such an expence as the advantage would repay. Where all the sources of boggy and wetness concur, the methods already describ'd are all to be used; where only a part, there part of the remedies is sufficient.

C H A P. VIII.

Of draining flat lands near great rivers.

THE borders of large rivers near the sea, afford a peculiar kind of lands that require draining. These lie within the reach of tides, and being also liable to the effects of land floods, no grounds whatsoever are subject to receive so large a quantity of water: but none are so easily freed from it.

These lands lie above the low water mark, and below the high; there are many of them along the side of the Thames, where they were once waste and neglected, but

at present they are drain'd, and are very valuable. These lands usually receive land floods, and give them into the river by a creek.

They have by some been confounded with salt marshes, but improperly: they have great advantages over them, in that they afford fresh water, which the marshes naturally want; and shelter for the cattle, in which they are usually as deficient. They have often all the requisites for being excellent land, and only stand in need of being drain'd and defended from fresh overflowings.

Whoever has such a piece of land, and intends rendering it serviceable, is freed from expence of drains; for the creek form'd by the fresh waters for themselves, answers that purpose. He is only to manage the outlet rightly, and to defend it by a bank.

The first work is, this bank. It is to be carried all along the edge of the land to the river, only leaving the opening of the creek for the present: for should that be block'd up, the land would be drown'd by the fresh waters, which would have no passage: and yet if it were left thus entirely open, the tide forcing itself up at its rise, would overflow the lands as usual, and burrow its channel deeper.

When the bank is made, the creek is to be stop'd up at once by a number of stout workmen, with good materials, who are to make a very thick and strong head to it, only laying in three or four long troughs of wood, which are to reach quite through the head into the fresh water of the creek, and to open into the river. These troughs are to be made each of four rough planks, and are to be open at the end next the creek; but at the end that comes to the river, they are to have each a door that flaps to, when the river water bears upon them, but opening out-wards gives way freely to the land floods.

When these troughs are laid in, the bank is to be carried on over this head, and all is done. The doors, opening out-ward, give way to the water of the creek, which runs freely all the time the tide is down; and when that rises, instead of forcing in, it only shuts the doors of the troughs. So that the whole inconvenience is, that none of the fresh water can get out, while the tide is at this height; but the trough being proportion'd properly, the discharge during the hours of low water will be sufficient. As the doors of the troughs keep out the water there, the banks keep it out from

from the edge of the field; and the whole is at once secur'd from inundation.

This is an undertaking the more profitable, in that the lands thus recover'd, are for the most part of the best kind we know for pasturage. There is some expence in making the bank, but it is easily kept up; and the troughs, if made of firm stuff, will last a great while without repair.

CHAP. IX.

Of the ordering of salt marshes.

A Great quantity of land in this kingdom comes under the denomination of salt marshes, and this is separated from all other land, being different in its nature, qualities, and products. The sea water is to be kept off from this, and that often at a considerable expence; but this is not all that is required for the rendering it useful according to its intrinsick worth. We shall not treat only of the means of keeping it dry: but the whole method of managing or ordering it shall be laid down.

A great deal of the salt marsh land is turn'd to a very good account: but the greater part even of that might be made to yield a larger profit, and some that is utterly neglected, might be render'd of great value to the owner. We shall shew the different conditions of sea-marsh land, and lay down not only the common methods, but such as are peculiar to certain places, tho' they may be useful in all.

What we understand by salt marsh, is a land that lies low and flat, and is within the reach of the sea, or salt water, at the mouths of great rivers. It is liable to be overflow'd by salt water, and the ditches are full of it at all seasons of the year.

Though this land be ever so good in itself, yet from this condition of being continually liable to overflowings of salt water, it will be soaked too much: it will hold no fresh water for the use of cattle: no trees or shrubs will grow well upon it; so that there will want shelter: and its produce will be liable to be cut off by the nipping winds of the spring, being expos'd to them, and to the sea breezes which are yet more destructive.

We thus see how many disadvantages this land lies under; but still its natural richness makes it worth taking care of. The labour must be more, and the expence greater

greater than that which is needful on the other kinds ; but it will answer very well by its fertility.

The two great inconveniencies are, the overflowings of the salt water, and the want of fresh. These may be provided against, and when this is done, if we add shelter, we shall bring them to be superior to any pasture lands whatsoever.

Let the undertaker examine their different condition ; in what degree they are liable to overflowing ; what quantity of building or banking will be needful to keep out the tides ; and in what respect they are as to shelter and trees.

Then let him set to work upon three great articles, keeping off the salt water, getting a supply of fresh ; and the giving that shelter which nature has denied.

The tides are to be kept out by banks or walls. When 'tis only the water of a river to which they lie expos'd, banking will do, but it must be at a great expence : where 'tis the main sea that beat upon them, walls are the best security. These must be made of vast thickness to resist the force and weight of the water ; and of a great height to defend the lands from the highest tides.

When banks are used, they are to be cautiously made in form as well as substance, and no expence spared in the giving them a due body and height ; otherwise all that is bestow'd is thrown away. When the main sea is to be fenced out from a good compass of flat marsh land, let the undertaker lay the foundation of his bank fifty feet broad, and carry it sloping all the way to the top. The height must be ten or twelve feet, and the thickness at the top about three feet. It is to be raised of sound earth well laid together ; and the slope is to be principally on the face next the sea. This part must also be cover'd with turf, like a bank in a garden ; that the waves may roll easily against it ; not bearing upon a perpendicular with all their weight and force, nor meeting with any thing to stop, interrupt, or ruffle them in their course.

The waves have fifty times the force against the ground where they are stoppt, and broken, that they have when they roll up evenly and smoothly.

While the face of this slope is entire, they always run up in that manner, and the bank is secure ; but whenever there is the slightest breach in the turf, they tear and enlarge it in a surprizing manner. This may instruct the owner to have the bottom of the banks carefully look'd to

from time to time, that the turf is kept sound. A small expence will answer this, for 'tis only two or three feet at the bottom that is liable to mischief, the tides rising but so high against a ten foot bank in their common course. The rest of the height is made for preserving against those extraordinary tides, which happen once in a year or two, or at greater distances of time.

Where stone is to be had, walls are an excellent fence against these seas. Their proportion must be nearly the same with that of the banks; and they answer to the additional expence by being more durable.

The name of a fifty foot bank may fright one who is not accusom'd to this kind of work, but it does not come to so much as might be imagin'd. 'Tis of this thickness only at the foundation, and 'tis to be made, for an expence that a few years of the profit by the land repays.

Where the sea has less power, a smaller expence will serve, but at the most, 'tis perfectly worth the charge.

When the land is thus defended from overflowings of the salt water, it will be in condition to bear pasturage: and the next consideration is to find fresh water. Let the undertaker, in a convenient part of the land, sink a large pond. Let this be well lin'd at the bottom and sides with a tough clay, and left to receive the rains. It will supply a large number of cattle.

The next deficiency is, the want of fences: whether these are requir'd for separating one piece of land from another, or not, they are sure to be needed here, for sheltering the cattle, and defending the grafs.

The first attempt is to be by plantations of trees and hedges. Ditches will serve for fences, and the separation of the grounds, but these are wanted for the other purposes.

If one kind of tree or shrub will not thrive, let the undertaker try another. There are some salt marshes on which none of the common trees will live; but even here there are uncommon ones to be called in. The late lord Petre, of Thorndon in Essex, gave slips of a particular shrub, called the fallow thorn, or sea buckthorn, to an owner of some marsh land, whereon no other hedge would grow, and it succeeds to this day very well. This is not the shrub one would chuse preferable to others for a hedge; but where the rest will not thrive, 'tis valuable.

Its native place is by the sea, so that no wonder it does in these places. 'Tis raised for its beauty in most of the nursery gardens, and may be had cheap enough; so that a fence is easily rais'd with it. When other things fail, he may try this; and he will be of service to his country, who contributes to make it known.

If this shrub cannot be had, or will not grow, it will not be necessary yet to give up the trial. Shelter is as needful as the keeping the ground dry, and other means must be attempted.

The undertaker is acquainted with the nature of banking. He has had it done in great strength, and consequently at a large expence on the edges of his land; let him order it to be repeated in a slighter manner, and at a smaller expence in the middle.

A bank will answer the purpose of shelter and defence, both to the crop and the cattle, as well as hedge; though it does not serve all its other purposes.

It will be proper to raise a couple of banks in strait lines along and across the land, or in any other direction where the course of the breezes renders a variation necessary. These may be six foot high, and just of a thickness to secure them from accidents. They will break the force of the hurtful winds; but that is not all their use, for they may be planted with trees and shrubs, which will grow upon them, though they would not upon the flat.

Care must be taken, that the trees and shrubs set on these are such as will stand the sea breezes best; and thus there will be the ground work of a fine plantation.

This is all that is needful to be done in the ordering of salt marsh land: by these means all the salt marsh land at this time taken in thro' the kingdom, may be render'd of double value; and great quantities that lie neglected, may on the same principles be undertaken with success. This will be adding even to the extent of our island. No lands are so perfectly added to it as those gain'd from the sea; and there are in many parts of the kingdom great tracts, which there requires only spirit and resolution to turn to a large account, an everlasting possession to their families who recover them. A great deal has been recover'd from the sea, which lay much more desperate, than many thousands of acres that are at this time neglected.

Let him who has spirit for such an undertaking, observe the situation of the recover'd salt marshes, and the waste

overflowed land of the same kind, and he will see beyond dispute or doubt, that more expence has been bestow'd upon the former, than is or can be needful on the latter. He will find those lands so recover'd, have repaid the charge long since; and that they will continue for ever a very valuable possession.

Marsh land when thus recover'd, exceeds all others for pasturage. It fattens cattle sooner than any; and they are safe from the rot, and many other disorders common in other grounds.

A great improvement of these lands, is the letting in the sea water upon them at proper times, and in due quantity.

The advantages of drowning meadow lands with fresh water, are well known: this answers that purpose, but not that only. Salt is an excellent manure in small quantities. Why should we not therefore allow it to these lands, when we have it so easily, and so happily in our power, by the giving them a proper soaking of sea water?

They owe their particular advantages to the effects of the salt water, why then should we not give it to them in a due proportion, after we have banked it out in those over quantities, in which it destroy'd the land? 'Tis certain, that in a due quantity sea water will add to the fertility of these lands; and it is easy in the ordering of their banks and fences, to provide for the letting it in at a proper time, and in due quantities.

'Tis upon the sea coast the largest advantages are to be made by taking in land for these purposes. Where the ooze is firm, and bears a tolerable shew of grass when the tide is out, the expence is easy, and the success certain.

They have in many places taken in the owze where 'tis soft, and cover'd at low water with sea weeds. This work comes dearer, and is subject to more disadvantages: it is therefore plain, the other may be done more to the profit of the undertaker, where nature favours the attempt.

When any one shall determine upon this work, he is to consider the substance of the owze, and to conduct his work accordingly: in some cases the bank may be made of the owze itself, and in the other, the matter of it is to be dug upon the land beyond: this makes a great difference.

The firm owze may be taken up, and rais'd directly into a bank of due height and proportion, for it will dry and grow solid in the working. Whereas the wet, soft and muddy

muddy owze, cannot be wrought into a bank, or if it could, it would not have strength to stand against the force of the water.

There is another reason why the bank may be made of the hard owze, and the earth dug from under it, whereas it cannot, nor must, of the soft; and this is the different effect the sea will take upon a hole being open'd in one and in the other kind. When a hole is made, though ever so large, in the hard owze, the sea can take no hold upon its edges, so that it does not increase in bigness; and as the ground is firm underneath, it cannot burrow deeper. The hole is therefore by degrees filled up by the sand and refuse wash'd into it by the water; and sometimes the place is render'd level again.

On the contrary, when a hole is dug in soft and muddy owze, it enlarges continually by the action of the water; and if it have been carry'd to any depth, burrows underneath a great way. If any ill-contriving undertaker should go to work upon a wet and muddy owze, digging from before the bank, what he employ'd in raising it, he would not only find it very difficult to raise it of so bad materials, and would perceive it to be very bad when made; but the sea continuing to burrow deeper and deeper in the hole out of which the matter was taken, would by degrees undermine the bank: all the labour would be lost, and the expence thrown away.

This soft owze may be taken in to great profit; the earth of which the bank is made being dug within: and if this be the case, as is seen by experience, to how much greater advantage must the other always answer.

The land where there is a firm owze, is better and richer than where it has been wet and muddy; and it produces a better and more wholesome pasturage: in this case it retains its former level, either entirely or very nearly, shrinking if at all, very little; whereas the other will often sink two feet or more in drying.

The soft or muddy owze is found by experience, a better and richer manure for other lands than the firm; but that is no objection to what is here asserted of the dry; for we have seen in the consideration of manures, that many things serve excellently for the giving richness to a soil, which will not afford nourishment to plants themselves.

CHAP. X.

Of hedges.

MANY things have been already said, occasionally, of hedges, respecting their advantages in inclosure, and the benefits which both the herbage and the cattle receive from their defence and shelter : we now come to the more immediate and full consideration of them.

No article, in the husbandman's whole concern, is of more importance. Hedges are the first object that naturally should strike his imagination, as they are the defence and guard of all the rest. We have seen how much inclosed land is preferable to such as lies open ; and as this advantage is originally owing to them, it will be the greater or the less, as they are better or worse managed.

In all inclosed lands the farmer must keep up a good fence, if he expect to reap the fruit of his labours. The better and the more perfectly the fence is kept in repair, the greater will be his security of his profits : ~~the less~~ it may do him more injury, by letting in cattle ~~than~~ than would have been the cost of a most ~~perfect~~.

A great deal may be saved or lost by a ~~proper~~ management of hedges : and in order to ~~the~~ the greater advantage of them, the farmer must do something more than follow the common tract : there is no part of the business in which we are generally more deficient.

There are many shrubs of which hedges may be made, but one kind is almost universal, that is, the ~~hedge~~. For one hedge of any other we see a thousand of ~~this~~. And there is reason for the preference ; for none succeeds so well, or answers the farmer's purpose so perfectly.

In places where this will not succeed, the holly, black thorn, elder, furze, and several others, are to be called in. When the hedge is made with white thorn, the careful husbandman will plant in it, at proper distances, timber, or fruit trees, and they will rise to a considerable profit ; but this, like all his other advantages, will be proportioned to the care he employs about them.

As to timber trees, one kind suits one soil, and another another : nor is there any one that may not be very valuable if rightly manag'd. General observations have been already laid down of the trees with which the several soils agree best : but as the successful growth of these depends



depends upon the depth, as well as the nature of the ground ; and on many other accidents, it will be proper for him who is about to plant an hedge, to begin with observing what trees flourish best in those of his neighbours ; for that kind will be best to plant in his own.

The ash about Brampton not only thrives better than elsewhere ; but it thrives better than any other kind of tree in that place : and the husbandman will have three times the profit from that he can expect from any other, when he falls upon a soil that suits it in the same degree.

He is in the same manner to study and observe all other kinds ; taking such as he sees thrive most freely on the like soil : for there is more profit in the meanest tree, where it thrives, than in the best kind, when starved.

Fruit trees in hedges, thrive as well as in orchards : elsewhere it may be proper to plant crabs, and pear-stocks, for the use of the orchard, in grafting apples and pears. Even the white thorn itself, is not without its use besides that in the fence ; for its root, when of a certain age, is knotted and veined in a most beautiful manner, and serves the cabinet-makers for many of their elegant works. This is a thing mentioned in old books upon these subjects, yet so little advantage is made among us, or what has been written for that purpose, that every body has enquir'd of what the Stilton cabinet-maker made his tea chests and other works, when his only wood was the white thorn root. He had the secret, as it was call'd, many years to himself, but at this time it is known in London.

C H A P. XI.

Of raising the quicksets for a white thorn hedge.

AS hedging is a very important article, we shall take it from the beginning, setting out with preparing the sets before we advance to planting them in his hedge. In order to accomplish the task, he should begin sometime before he intends making his hedge ; for by thus preparing, in time, he will have all in readiness ; and save the expence of buying what he may raise.

He will want, in due time, a good quantity of white thorn plants, and let him prepare for them in this manner. Let him make choice of a square piece of ground, any waste corner may do ; but, to chuse, it should be upon a poor and dry soil. This he is to use as his nursery. It must

must be within a good fence, that cattle cannot get in ; and it must stand defended from the north and west.

In November let this be plowed up, and early in the succeeding spring let the seeds be sown ; the ground having been well weeded during the winter. The manner of sowing them is this :

Let furrows of five inches deep be made, at two feet distance : in these sow the seeds of common haws, gather'd the autumn before, and kept dry during the winter. When they are evenly sprinkled in, cover them with a rake ; and leave them to the time of their shooting, which is not till the second year.

As soon as the plants are above the ground, weed between the rows, and give the ground a good watering. Repeat this at times, till they are got up to a tolerable height, and their stems at the bottom are as thick as a man's thumb.

That is the size at which they are fittest for use. They are to be left standing in the nursery till the bank is prepared for them, as shall be directed in the following chapter ; and they are then to be cut off, within five inches of the ground, and carefully drawn, that their roots be not injur'd.

Some sow the seeds in their coppices, the year before they fell their underwood ; and the young sets are thus got ready for use without damaging the wood, or taking up any particular piece of ground.

Some prefer raising their sets from plants, the seed being a tedious method of obtaining them. But they are best from seed.

Whichever method the husbandman chuses, let him take care to be provided with a sufficient quantity of sets, of a proper size, against the time when he shall want them.

C H A P. XII.

Of making the hedge.

THE husbandman is now to take a view of the ground, that he may know how to set about his work.

In some places a quickset hedge alone is sufficient ; in others a ditch is necessary : this last is the most general condition.

The first thing is to mark out the course of the ditch, and its breadth. It must be three foot wide at the top, and

and its depth is to be two foot. Some dig the sides perpendicular, but that is liable to inconveniences; the rains will wash in dirt from the edges; a great deal more will be thrown in by the cattle trampling about it; and they can walk and turn about in it; so that they will be continually in the ditch, and cropping the young shoots of the quick.

To prevent this, the making the sides sloping, and the bottom narrow, were invented, and it is preferable to the other method on all accounts. It is best to allow but a foot breadth at the bottom of the ditch, when it is a yard wide at the top. This will give such a slant to each side that the edges cannot easily break in; and it will cramp the legs of the cattle so, that as they can neither walk easily, nor turn about in the ditch, they will not get that habit of going into it.

This breadth and depth are, in general, sufficient; and where it is judged convenient to make the ditch larger, it must be carried on in the same proportions.

When the breadth is thus mark'd out, let the labourer be set to dig; and to prepare the bank for the quick, let him lay the turf regularly, with the grassy side downwards, upon that side of the ditch on which the hedge is to be raised.

On this turf, let him spread the best of the mould; and having thus prepared a bed for the quick, let the first row of it be brought in and laid.

Let the sets be strait, smooth, and well rooted: and let them be fresh taken up. The beauty of the fence will be owing to the choice of the shoots, and their growth will, in a great measure, depend on the planting.

Let the quick be laid carefully in. The sets must be plac'd on this bed, at a foot distance; and with the end inclining a little upwards. The fruit, or timber trees, must also, be planted with the quick.

Let the course of the bank be measured, and at every thirty foot place a mark. At each of these plant a thriving young tree of oak, ash, elm, or whatever kind is found to succeed best in the neighbouring soil; or of such fruit trees as will agree with it, taking care to set these upright and steady.

One row of quicksets being thus laid, let them be covered well with some of the best mould; and upon this

let

let there be laid a covering of turf, turn'd bottom upwards.

Upon this spread another covering of the best of the mould, to make a bed for a second row of quick. This is to be laid a foot thick over the first row ; and another parcel of sets are then to be brought fresh, strait, and well rooted as before directed. These are to be laid in the same manner, with the ends inclining a little upwards, and placed at a foot distance one from the other ; each in the middle of the space between every two of the first row.

They must be cover'd with good mould, three or four inches thick. The soil that is dug out of the bottom of the ditch, is there to be laid over, and the bank finished with it.

The hedge and ditch are thus finished, and there requires nothing more but to secure them from injuries.

The very form of the ditch defends the young quick while shooting, but there requires more for its preservation : Cattle would climb over such a bank as this ; and destroy all the work ; and the fall scorching sun upon the young sets, would be too powerful.

For their defence and shelter a dead hedge is to be made at the top of the bank. Which being well wrought together, will stand till the quick is of such a height and strength, as to be a sufficient inclosure to the land.

A proper quantity of bush wood must be provided for the dead hedge, and a proportionable number of stakes. No wood is better than oak for the stakes. If that cannot be had, fallow will answer very well.

The stakes are to be driven into the ground : they must be of such a length, that they may be thrust quite through the bank into the firm earth below, and enough remain above for the service of the hedger ; if they do not penetrate four or five inches into the soil under the bottom of the bank, the whole hedge will stand but an ill chance.

They must be driven at two foot and a half distance. Then let the workman begin the hedge. He must lay the small bushes at the bottom in such a manner, that they may cover the quick when it first shoots, after this the long bushes are to be laid in, and the longest of all at the top twisting them between the stakes.

When the hedge is carry'd to its due height, let a parcel of long and slender poles be provided, and the tops of the
stakes

stakes bound in with them on each side ; this is what is called eddering a hedge : and finishes the work.

As the stakes may have been moved in the making up the hedge, the prudent husbandman will see them all well driven again. A few inches more in depth gives them now a great strength, and the hedge is thus secur'd against all accidents.

C H A P. XIII.

Of the seasons for planting quicksets, and the choice of the kinds.

WE shall add to this construction of a hedge the several particulars relating to the time for making, and repairing the work ; and the choice of his seeds.

There are two seasons for planting a quickset hedge, early in spring or late in the autumn.

For the spring planting, the last week in February, and the first in March are the best ; for the autumn, the whole month of October, and the first and second week in November : a quickset at either of these seasons will grow ; but we prefer the spring plantation.

I have try'd more than once the practice of laying three rows of quick into the bank instead of two, but I have never found it succeed so well. They require that the bank should be of an unevenly height, to keep them at a due distance : and if this be not done, they starve one another.

The roots of white thorn spread a great way ; but a great deal of the nourishment is for the first three or four years taken up near the stem ; and in this case the three rows blend their roots together, and destroy the growth of each other. More wood will be produced in the six first years from two rows, than from three.

In places where the young quick will be too much exposed to cattle, there may be a dead hedge rais'd on the edge of the ditch, as well as on the top of the bank. This is an additional expence, but it keeps the work secure.

When the quickset hedge is made without a ditch or bank, the plants are to be disposed in a different manner. They are to be set nearly upright in two strait rows by line, and at about a foot distance one from another. They will thrive thus very well ; but they should be fenced with a high dead hedge on both sides, for they are more exposed to mischief of every kind, than the others.

Most

Most soils will bear the hawthorn, and where it will thrive tolerably, it is preferable to any other shrub by way of fence. Where there is too much wet, or where the soil is perfect sand, it does not succeed; but for these places other shrubs will be proposed in the succeeding chapters.

If the careful husbandman looks into the hedges, he will see there is a difference among the hawthorn shrubs; some having more, some fewer branches; and some much larger leaves than others. As we have advised him to have a little nursery for the raising the sets, we shall add a very material piece of advice, though little regarded in general; that is, that he gather the haws himself, and that he take a particular notice from what shrub he takes them.

The hawthorns with smallest leaves have most branches, and the greatest number of thorns. These will make the best fence: and they are the sturdiest, and least liable to accidents while young.

Let him gather the haws when they are well ripen'd, from one of these small leaved bushy shrubs: the sets will follow the nature of the parent tree, or improve upon it. The poor ground of the nursery will be best; for richness in the soil throws nourishment into the leaves, and not into the woody part.

One reason of having the nursery upon a poor piece of ground is, that from the seeds of a small leav'd hawthorn, the sets may continue of that kind; but on this circumstance depends also their thriving in the hedge. Young trees when they are taken out of a rich soil, and planted in one that is poor, never thrive well: on the contrary, such as are transplanted out of a poorer soil into a richer, grow surprizingly. The banks on which quicksets are planted for hedges, rarely are of an over-rich soil; so that the way to have the sets thrive, is to raise them in one that is yet poorer.

The poorness of the soil is more needful to raise the bushy hawthorn without failure, because this is not a distinct kind, but only what the curious call a variety; so that if the seeds be sown in a mellow land, they will produce a stragling, loose, and large leav'd shrub.

CHAP. XIV.

Of keeping the hedge in order.

WE shall suppose the hedge now made ; and proceed to the necessary care of it.

The next spring after the laying of the quick, let the farmer go over the whole bank with a careful eye ; first examining the dry hedge, whether it be firm. If he find it loose any where, let him drive a new stake, or fasten the old ones : and if any other deficiency appear, let him see it repair'd in the same manner. A small expence will do this the first year, whereas it might be ten-fold the next.

Next let him view deliberately the quicksets. Some, in spite of all his care, will fail : he will find some dead, and others in a declining way. He must see fresh sets put in the place of the dead ones ; and trim up the others.

Some advise the planting the fruit or timber trees in the hedge at this time ; and others recommend doing it when it is at two, three, or four years growth : but we greatly prefer the planting them at the making of the bank, at the same time with the quick : for thus they take their growth together ; and there is no disturbance of the fence, as there must be in planting them when all is settled.

The young quick should be weeded carefully and thoroughly : and this must be repeated at times, for the quick, while it is young, should have all the nourishment the ground can yield. This clearing will also give a distinct view of the condition of the sets, that he may know what to supply.

While the shoots are young, too much care cannot be taken to guard them from sheep : they are very fond of the tender buds : and their cropping them at this period is particularly destructive.

If sheep have got at it, or other cattle, it will be discover'd by the tops being eaten off, or crop'd irregularly, and mangled at the ends. In this case there is but one method to restore any hope of a good hedge : the whole growth must be evenly cut off, within an inch and half of the ground ; and there will be a new and fresh set of shoots that spring.

If the weather have been unfavourable, or the soil too poor ; or if from any other accident the shoots are perceived to be weak and bad : the same practice is to be observ'd : they must be cut off within an inch and half of the ground.

This

This will give the roots new strength ; and the second shoot will not be so faint.

After this very little care is required till the hedge is of a growth for plashing ; this is not till eight or ten years after the planting. But though little care be required, less usually is taken.

Let the industrious husbandman from time to time look to it ; remove its redundances, and supply the defects. Let him with his knife take off ill-shap'd and stragling branches. Let him see that no unnecessary dead wood be left at the bottom, for that will choak the quick. And let him carefully root up all those tangling weeds, which are so common in hedges, and at once spoil their beauty, and injure their growth.

The principal of these are four. White bryony, black bryony, travellers joy, and bind weed : these all cover the hedges to a great extent.

White bryony has leaves like a vine, and red berries. The root is as big as a man's leg, and whitish ; it must be dug out deep, for it runs a great way into the ground ; and if any piece be left, will shoot from it. Black bryony will grow thirty foot long, and entangle and choak the quick all the way. It has leaves like a heart, and the root is thick, black on the outside, and white within. It must be dug up like the former.

Travellers joy has woody stalks, and spreads a great way. The leaves are small, and of a pale colour ; and it bears white thready tufts in autumn. This is more destructive of the quick than the others ; over-shadowing it in the manner of an arbour. The root of this is not large, nor lies deep ; but the farmer must take care he gets it up entire, for the least piece will shoot again ; and the bush is of quick growth.

Bind weed is the smallest of these, but it will crawl among the branches to fifteen foot length ; it has leaves shaped like the head of an arrow, and bears large white flowers like bells. The root of this weed is slender and white. It does not go deep, but runs a great way under the surface ; and should be got out entire, for the least piece will grow.

All these weeds should be watch'd in their young state, and tore up before they come to flower or seed ; for after that there will be an eternal brood of them : but if they be thus destroy'd, all the farmer will have to do is, to watch the rise of such as come from chance seeds, and they are but few.

By thus keeping a watchful eye from time to time upon the
the

the growth, the farmer will raise his quickset hedge in strength and vigour : and by as much as it is handsomer to the look than those of his neighbours, so much it will be better, and more healthful.

C H A P. XV.

Of plashing a hedge.

THE plashing of a hedge is to be first perform'd at about eight years growth, but this is not the only time. It must be repeated afterwards at different periods ; and as there is more art requir'd when an older hedge is be plash'd, than when it is a young one, we shall best instruct the husbandman in doing it, by describing the method to be observ'd when the growth is old. What is to be done in plashing a hedge of twenty, or five and twenty years growth, includes all that can be needful for doing it on one that is younger.

We will suppose the hedge of five and twenty years standing. It will by this time be loose and irregular in its growth, there will be vacancies at the bottom, and gaps in many places, and it will be full of thick and old stumps, and stubbs, as well as of young shoots. These latter only are for use : the others are to be cut up, for they encumber the hedge, and prevent the growth of better wood.

The stubbs are useless. Among the rest he must reserve some shoots for laying down, and others to serve by way of stakes. For the first purpose he is to select the longest, and freshest ; and such as are of a middle growth : for the stakes, he is to leave somewhat larger, and such as stand properly, and grow tolerably strait for the first five or six foot.

He is then to cut away all the old stubbs within two inches of the ground, striking them off sloping. After this let him go on thinning his hedge, by cutting away all but the proper shoots for stakes, which he is to strike off at the height he designs his hedge, and the long shoots for laying, which he is to leave entire.

As there will not be enough of these shoots for stakes ; he must cut some others to drive into the ground, where there is a deficiency.

When the useless stuff is cut away, a spade may be got between the shoots ; and the labourer is to be employed to clean and new make the ditch. Let him dig this just as it was at first ; making the top wide, the bottom narrow, and the sides sloping :

Let

Let him as he goes on clean all filth from about the roots of the quick ; and where the earth has moulder'd away from them, add some of the best that comes out in digging the ditch, pressing it well into the hollows. A vast many small roots are thus cut off, and they might be supposed hurt, but they soon send out many more. The stirring of the earth about them is of great service ; and thus the roots having a greater than ordinary supply of nourishment, and having a smaller quantity of wood to feed, that which is left flourishes afterwards surprizingly.

A great deal of the best mould from the ditch, will be us'd in filling up holes, and facing the bank, the rest is to be laid at the top : for if the sides be loaded they will break with the rains, and what falls off will choak up the ditch. It is of great service when laid on the top, heightening the bank, and greatly improving the fence. The labourers don't like to hear of this, because it gives them more trouble, but it is the master's business to see it done.

In the making of the hedge, fruit or timber trees are planted at proper distances. These the husbandman is to leave standing among his shoots. They have nothing to do with the hedge, though they grow among it. They are to be lop'd in the usual manner, if timber trees ; and if fruit trees, they must be prun'd up above the reach of the cattle : all that is to be done to them at these reparings of the fence is, that partly by this pruning, and partly by staking, if necessary, they are to be brought to spread and lean over the proper ground, where both sides of the hedge are not the owners.

The ditch being clean'd, the bank repair'd, and the stakes ready ; let the new ones be well and firmly driven, the work is then ready for the plasher.

He is to take each of the long shoots severally, and bending it gradually he is to give it a sloping cut with his bill half through ; it will then fall easily, and he is to weave it in between stake and stake.

When he has laid in all the shoots, he is to go over his work, and trim off the straggling sprigs, to render it uniform and even.

A great deal of the success depends upon the method of laying these boughs. If they be laid too low and too thick, as many do, thro' an opinion of its strengthening the hedge, the sap is all sent into the shoots ; and the plashes starve and will decay. On the other hand, if they be laid too high, they draw in all the nourishment ; and the shoots are starv'd,

starv'd. Both these accidents are to be avoided by a middle course. It is not the farmer's interest to starve the shoots to feed the plashe, nor to ruin the plashe for the shoots: he is to derive a proper quantity of nourishment into both; and this will be done by laying them in a middling way. If the plashe are not too deep cut, and are laid thus evenly, or nearly upon a level, the sap is not all directed to their ends, but sends up shoots from every part.

This abundance of young shoots will be promoted by the proper cutting of the branches of the plash'd boughs. They are to be taken off at five or six inches length on each side of the hedge: this will make them send out side shoots of their own, as well as promote the growth of the others:

Many make their hedges too high. Let the bank be rais'd carefully and firmly; and let the hedge be made just high enough to serve as a fence, and no more; for it will quickly raise itself higher: and always in those hedges which are made too high at first, the quick is straggling at the bottom. The lower the hedge the more free the shoots always grow, and the thicker and closer is the fence.

A hedge must be of a considerable growth to require this full care in the plashing: when it is younger the business is done with more ease. The husbandman has sometimes to do with a hedge that is too old to be repaired by any plashing.

In this case let him cut up all the stubs, and make a good dead hedge on each side, to secure the young shoots that shall rise, till they are of a proper height to plash. As there will be vacancies between some of the stubs, these are to be supplied by fresh sets: they will grow up with the shoots from the stumps, and the dead hedges are to be kept in repair till these are of an height to be useful.

When an hedge is new plash'd it shoots out vigorously, and these fresh branches tempt the cattle. It is therefore always best, if the field can be kept from feeding the first year. If it be kept for mowing, that answers some purpose, but if plowed, it is of twenty times the service; because stirring and turning up of the ground gives vigour to the roots of the quick, and forwards the shoots prodigiously.

The farmer is thus to suit his several businesses to one another.

another. He is never ty'd down to a particular year for the plashing a hedge: let him therefore take the opportunity of doing this when the ground is to be plowed, or at least when it is to stand for hay.

If he cannot do this; let him remember what cattle are most and what least mischievous, that if he must feed the ground it may be to the least disadvantage. Horses are least apt to crop the quick. Cows and oxen are too fond of it: but sheep most of all. They must therefore be kept out of the ground for the first year.

The season of plashing of hedges, is the month of February.

While the hedge is growing up from the plashing, it will be proper to have the same eye upon it as at first; taking care, in spring and fall, to cut away the straggling branches, and to root out weeds: thus the fence will grow regular, thick and clean; and exceed, in every respect, those which are not looked after with the same degree of care.

When the hedge is plash'd, the shoots laid down, and the straggling branches of them are to be cut away, let there be a reserve made of the finest, toughest, slenderest, and longest of them. Instead of cutting these out let the workman bend them to his purpose, and to that end give them a nick at the bottom, if necessary, and then bind in the rest with them. This finishes the hedge beautifully and durably. The whole work may be afterwards, at times, over-looked, the dead stakes driven a little down, and the plash'd boughs pressed also gently lower: all which will make the hedge more firm and durable. Where from necessity, or accident, there is no keeping cattle away, it is a good practice to scatter some dead thorns over the top of the hedge, and about its bottom, by way of defence, till the young shoots have some strength.

When in a very old hedge the stubs are so large that they break in upon the uniformity, and are liable to gaps by the cattle getting by, at one side or other of them, the method is to cut them so nearly through by the ground, that they may be bent down;—they are then to be sway'd till they can be laid slanting, the head of one upon the stump of another; and the natural vacancy in the slant is to be fill'd up with the side shoots. By this method, and by keeping the bank in good repair, a fence may be made out of very unpromising materials; but in general it is better

ter in these cases either to cut down the stubs, as before-directed, making a dead fence on each side, and waiting for a fresh shoot from the roots; or when the case is more desperate; as when the roots are extremely old, and stand very straggling, to stub the whole up entirely, and begin from the foundation, making a new quickset as first directed.

CHAP. XVI.

Of the profits that may be made by hedges.

SO easy is the making and preserving a quickset hedge, when the husbandman will be careful: but he is not to content himself with giving his orders, and leaving all to the care of idle labourers, and negligent servants. They are not to reap the advantages, and they cannot be expected to take the due care. He is inexcusable who is to have all the profit; and who will not overlook the work.

From the little care that is generally taken about hedging, it appears that the profits which may arise from it are not sufficiently known: we shall therefore speak what our own experience has shewn on that head, to stir up the husbandman's spirit.

It is the landlord's interest to plant or to promote the planting of fences, because the rents of his estate are sure to be encreased by it: and we shall shew that it is not less the tenant's interest than his. Several grudge to serve their landlord when it turns to no account for themselves, but may be brought into it when they find it will also answer their own purposes. And upon this plan there will be no oppression in a landlord's insisting upon a covenant of fencing, in the lease.

If hedges were of no use but as fences, it would be the farmer's interest to keep them up carefully: for the better the fence is, the greater is his security of his cattle and crop. But in many counties of England the hedge yields a valuable store of fruit; and it might do so in all: this being partial is owing to custom only, the same advantage is allowed to all by nature.

The shelter of hedges, which we have shewn to be so useful both to the crop and cattle, is the tenant's benefit; but the greatest inducement is, the absolute profit; which, for want of industry and application, few know. In reality they rob themselves of a great deal of money, by their

carelessness in this, as well as other articles; for it is as much their interest, in this view alone of the wood they will yield, to raise, cure, and dress their hedges, as to tend any other part of the stock.

Mr. Ellis, who is a person of veracity, affirms from his own knowledge, that a farmer in Hertfordshire, who occupied only sixty acres of land in inclosed fields, made in one season a thousand faggots from his hedge-wood; which he sold for about twenty shillings a hundred: and I have seen nearly as much profit in other places, where the quick does not grow so freely, nor is so well understood in hedging as in Hertfordshire: that county being, in this respect, the garden of England.

CH A P. XVII.

Of the sloe, or black thorn hedge.

ALTHOUGH the white thorn is the most general shrub us'd in hedging, and the best for that purpose, it is not universal, nor absolutely suited to all. There are soils in which it will not thrive; and there are circumstances which may render some other kind preferable, even in places where that would grow well.

The black thorn is next in value to the white. And is preferable to that and all other shrubs, for a dead hedge; because it is the most thorny, durable, and naturally bushy.

The ground can never give a reason for planting black thorn, and not white, for they both grow and thrive in the same soils; and if any thing the black thorn requires a better: but we have mentioned a substantial reason why the farmer should plant it.

As no dead fence is so good as that made of black thorn: the person who sees he shall have occasion for a good deal of dead work, at any particular time, or occasion, will do well to plant at least some quicksets of black thorn; that the cuttings, and superfluous stuff rising from them may afford a sufficient supply.

But let him consider his soil before he sets about it. More is required than his having occasion for the bushes, he must know that the ground will bear them.

A very poor soil will not do for this shrub, and in a very rich one it is apt to shoot too deep, and spread too far into the ground, to the hurt of other things. I have seen more
hedges

hedges of live black thorn mis, than of any other shrub whatsoever : this has been sometimes owing to the badness of the ground, but oftener to the unskilfulness or negligence of the person employ'd to plant it : and I have, in other places, where such an hedge has throve very well, seen all the other growths starved within a great way of it, merely by the quantity of nourishment it exhausted.

When the husbandman sets out with this foundation of knowledge, of the nature of the shrub, he will work on it to his advantage. Let him chuse a part of his land where the soil is rich, but not deep. A two foot coat of hazel mould upon a bed of stone, or a layer of clay is best : if any such offer upon the land, the farmer will be sure to raise an excellent fence, and to do himself no harm in his other products.

Let him prepare for planting his hedge as has been directed for the white thorn ; only dig the ditch half a foot deeper, that it may go a foot and a half, or more, into the under layer, to stop the direct progress of the roots into the land. They will sink down below the bottom of such a ditch, and rise up again on the other side, but not in such quantity.

Let him, some years before hand, turn up a little piece of ground in some waste corner, sow it with the stones of floss, and fence it well in, weeding the plants now and then, after they are come up, which will not be till the second year after sowing ; and letting them stand till they are of a size for sets.

When they are ready, the whole practice is to be the same as for the white thorn. And there is this advantage when they are carefully set, and the defects supplied after the first examination, that they grow much quicker to a certain standard ; and being more prickly, and not so well tasted, they are not so liable to be crop'd by the cattle.

There is a considerable advantage in raising the sets in a little nursery of this kind, they grow straiter and better ; and when they are removed to a richer soil, their first shoots are much more vigorous. The farmer will do well when he takes up the sets for his hedge, to leave several standing at proper distances in the nursery : by this means he will have a supply of the bushes for stopping up of gaps, and other such uses, for which they serve better than any other kinds ; before his hedge affords them from the cuttings.

C H A P. XVIII.

Of the furze hedge.

THE sloe is a kind of hedge which will answer all the purposes of a fence, and which there may be particular reasons for planting, even in places where the husbandman might, if he pleased, raise the white or hawthorn: we here speak of a shrub which is also very excellent for a safe and durable fence, which, at certain seasons of the year, is also very beautiful; which always makes a pleasing variety among other inclosures: it has also this greater advantage, that it may be rais'd in soils and situations where neither the white nor black thorn will grow.

We in many parts of England, see furze growing wild in abundance, upon sandy, heathy, and the most barren commons; where only here and there a black or white thorn shrub shews itself, and those half starv'd.

There are two soils in which the white thorn hedge is not to be planted; these are very wet, or very sandy. What is to be substituted in wet places, will be named hereafter; furze is the proper shrub for the dry and barren; for there is no ground so barren on which furze will not stand.

Where there is a piece of land to be enclos'd, from some barren heath; or where the place for a fence is some old dry and mouldering bank of sand; or where the ground is an entire gravel, or scarce deserves the name of a soil, there this shrub will succeed. The worst objection is, that it does not last: but it is easy to be renewed, and makes an excellent fuel. If we would copy the French, in their management of furze, planting hedges of it of thirty or forty feet thick, in places where the ground is really not worth culture, we should reap an advantage little imagin'd. We have not so much ground of this sort as they, but where there is, it might better be used to this purpose than to none; planting the French furze; which grows five or six yards high, and does not require any care after the first year or two.

These thick hedges are a favourable shelter for game; which is there the property of the farmer; and they cut it up in the end for fuel.

A barren soil, and an expos'd situation, is the place for a hedge of furze. Where the farmer has such an occasion,
let

let him not plant any other shrub : nor in this is he to proceed as with the others.

There is to be no nursery for raising the sets, for there need be no transplanting. The shrubs must be rais'd from seed in the places where they are to remain.

In the place where the hedge is to stand, let the ground be plow'd up deep in winter, and let it lie in that condition till the end of March. At that time let it be once again plow'd, and then harrow'd, to make it as even and fine as possible. When this is done, in the beginning of April, go carefully over the prepared ground, sowing it with well chosen and fine seed, of that kind called French furze.

When the seed is in the ground, let a dead hedge be planted on each side. It need not be a strong one, for it will be necessary only three years. The seeds will soon shoot, and the plants when risen to some little height, must be thin'd and weeded. They must be kept weeded from this time till they are become tolerably sturdy, for then they will not suffer weeds about them ; and in three years there will be a strong and beautiful fence.

As the furze hedges require less cutting than the other kinds, so they will very little bear it. It is seldom needful to cut them in fields at all ; and those over-nice people who will do it, often destroy the plantation. The French furze rarely grows out much beyond the bounds that were intended, for this kind does not spread and run like the others : but to do so, the best way is to cut it up close to the ground, and leave it to shoot again from the roots.

In this case it must be defended as at first, and it will soon spring up in great regularity. If the circumstances will not admit of thus cutting it up ; and it be needful to reduce it to bounds ; this must then be done by cutting : but as that is in itself hazardous, great care must be taken in the manner of doing it.

If furze be cut too close into the old wood, it will never shoot out again, so that when needful to cut it, that must be done lightly. The season must be regarded also, for nothing is so liable to accidents from the weather as fresh cut furze. If cold follows, it certainly kills the branch that has been wounded, and often the whole shrub : therefore it must not be cut either too late in autumn, or too early in spring.

On the other hand, if it be cut in extremely dry weather,

ther, the same accidents follow as from frosts, the dry winds attack the fresh cut part and destroy the whole.

For these reasons 'tis much best, never to cut one of these hedges at all; but if it must be done, the only season is the middle of April, and then in moderate weather.

Whether a furze hedge be new rais'd from seed, or whether from the old roots after cutting down, no fence requires so much care in the guarding of it from sheep, while first shooting. When young, they are extremely fond of it, for the buds are soft and juicy, but when it has got a little strength and firmness, its own innumerable prickles are a sufficient defence.

One farther advantage of a fence of this shrub, is, that it will grow on the barren and naked sea sand. This points out a very great use for it, which is in the making of fences, where every thing else refuses to grow: these places being generally supposed not capable of hedges.

Scarce any cattle will attempt to crop furze of due growth, which has occasion'd some to imagine, that it is unwholesome, most creatures having a natural direction to avoid all such herbs as are hurtful: but this is a common error. Nothing causes this shyness of cattle, but the prickliness of its branches. They sow the French furze in some of our western counties, on land that will bear nothing else; and among other uses, the green tops are chop'd small, and given to their horses. This chopping destroys the prickliness, and the creatures are then very fond of them, and very well nourish'd by them.

C H A P. XIX.

Of the holly hedge.

HOLLY will grow in very indifferent soils, where the white thorn will either not live at all, or very indifferently. But this is not the only reason to value it. Nothing makes a stronger or a better fence. It is slow in its growth at first: but every thing has its advantages and disadvantages.

I have seen old holly hedges in the country make a poor appearance, and some grown quite useless: but so will hawthorn, if neglected. The same care that is required for others, is also wanted for these, and no other. If that be omitted, all hedges will, after a certain age, grow bad.

Holly loves a light dry soil: and it will live on the most barren,

barren. It has been said of furze, that it will grow on a dry sand, or entire gravel, the same is true of holly: but between the two there is this difference, the furze is the best suited to sandy, and the holly to gravelly grounds.

There is also another kind of soil, too common in some parts of England, this is the stony. In this the hawthorn is starv'd, and the roots of the furze will be burnt up. The holly will thrive and flourish upon this, and it is the only proper shrub for a fence on such grounds. It may be used on many others, but no other kind can be rais'd on some of these. The holly loves warmth and dryness about the roots; and will grow almost upon a rock.

Holly is one of those shrubs whose seeds lie two years in the ground; but there is a way of avoiding the tediousness of this.

Gather the berries when they are full ripe, and laying them upon a large coarse cloth, rub them gently with another to break them: wipe off the tough juice from the seeds. They need not be made curiously clean, but a great deal of this useless matter may be taken away with little trouble.

When the seeds are clean'd, mix them with some dry sand. Fill a large garden pot with this, and digging a hole in the ground bury it. Let them lie thus from the autumn when they were gather'd, till the beginning of the September following. Then take up the pot; prepare a bed of good light earth, and sow the seeds in it, covering them slightly with a little of the same mould. They will shoot the next spring, and thrive, though slowly. They make very little advance for the first three or four years.

There remains a question, whether it be best to have a nursery for this purpose, or to sow the holly where it is to stand? This must be determin'd by the soil. If the ground be poor and stony, it is best to raise them upon the spot: if it be somewhat better, the right method is to raise them in a little nursery, such as has been before named, and to remove them at a proper time from thence, to the place.

In sowing them upon the spot, some cautions are necessary. If the soil be of an exceeding barren stony kind, the seeds may be burnt up before they take root. Let the place mark'd out be plow'd up deep, to see if any good mould can be rais'd from below. If not, the farmer must be at the expence of having a small quantity carried thither, and strew'd upon the place. Upon this, they are to
be

be sown, and a good and durable fence of a dead hedge is to be made on each side.

When the ground is somewhat better, the right way is to raise the plants in a nursery, and keep them there till they are of the thickness of one's thumb, they are then to be removed to the place, and carefully laid in, chusing a mild and moist season. For some time after, they must be shaded and watered, if the season be dry. They will thus take root firmly : and if some of them seem to die, they must be cut off close to the ground, and they will recover.

In this case they require a dead hedge on each side, as well as when rais'd from seed, for they are even thus a considerable time before they come to their strength, and while they are young and tender, the sheep are fond of feeding on them : when they are grown stronger, they need no defence, for the pricklyness of their leaves is sufficient.

Some when they plant a holly hedge, intermix white thorn. They plant four sets of white thorn, and one of holly ; and as the holly grows, they pull up the quick or white thorn. The use of the white thorn is to raise the fence the speedier. When the shoots of this are all pulled up, if the holly stand too thin, they lay down layers from it where the vacancies are, and thus it may be thickened at pleasure.

When the hedge is raised by sowing, the young shoots are to be thin'd, when they are two or three inches high, leaving the straightest, and heartiest : after this they must be weeded, and at times it will be proper to stir and dig the earth between them and the dead hedges.

Thus may the holly hedge be rais'd with certainty and success. Its fault is the slowness of the growth, and the care that is requir'd while young. But this is all that can be objected ; for in other respects it exceeds all other fences.

No hedge is so beautiful ; none so strong. When well grown, it appears as a wall rather than a hedge, and is altogether impenetrable by cattle : in this excellent condition it remains a great many years. The use of hedges is not only for a fence, but a shelter. And no hedge answers this purpose equally to the holly. An eye cannot pierce, nor can the wind blow through it. All within is defended as a piece of garden ground, with walling.

The wood of the holly when it grows to a due age, is also valuable. Cabinet makers and inlayers purchase it at a considerable

considerable price : and of the bark is made birdlime. These, added to the value of it in the immediate article of fencing, make it surprizing, that in a country where in general it will thrive so well, it is so little planted. I hope these observations, which are the result of experience, and confirmed by repeated practice, will make it more common.

Where thickness and strength are required, nothing answers the purpose equally to holly, and it will grow to any moderate height. The only trouble is at first : and that is more with the transplanted sets, than with the shoots raised from seed. These last require little more regard than the black thorn, or any other. As to the sets, if the season prove unfriendly, they must be treated like garden plants, and must be shaded and watered till they take root, but after that they are no more troublesome.

Holly, which is thus fitter than almost any thing else for a field hedge, and is one of the unfittest that can be conceived for a garden, yet is in a manner in England confined to the garden, and neglected in the field.

The very thing which gives it its preference in the field, is the great objection to it in a garden. This is the largeness of the leaves. These in the field, fill and please the eye, and thicken the defence : and they always appear beautiful, because they never are cut. In gardens they must be cut ; for there every thing is to be kept in form ; and the cutting of a shrub with such leaves is improper, because they look ragged.

Fancy has taught people to be fond of the variegations of the holly ; and great pains are taken by budding and grafting to streak and edge the leaves with white and yellow ; these are esteem'd beautiful, but to a reasonable eye, they have only the aspect of sickliness. They may be called pretty, but he who has seen a free growing holly in its own strong and healthy green, with its branches playing in wanton luxuriance before the wind, must think a strip'd cut holly, a very miserable alteration upon that beautiful tree.

When the holly hedge is to be raised by sets from the nursery, great care must be taken, that the season is not dry or cold at planting. The end of April, in the midst of warm showers, is the best time : but it may be done toward the latter end of August, if the weather be cloudy, cool, and now and then showery.

C H A P. XX.

Of the elder hedge.

WE have treated of the four most useful shrubs for fences ; and we here mention one which at first sight may seem of a trifling and improper kind : but there are reasons for preferring it on certain occasions. Black thorn, though inferior to the white, may frequently be planted in its stead to advantage : and in the same manner, though elder be inferior to all that have been named, there are occasions that may render it proper ; nay, more proper than any of them. It is fit the farmer should know these, and the nature, use, and value of this weak shrub : that he may proportion his choice to the necessities of the occasion, and to the value of the natural produce.

Elder is neither so strong in its branches, nor so close in its growth as white thorn, black thorn, furze, or holly ; nor is it prickly as they are : these defects render it inferior to them all for a hedge ; for these are the great and general requisites of an hedge shrub : but there are some occasions on which this toughness of branches, this closeness, and prickliness are not requisite ; and in these the elder may serve.

These shrubs have their inconveniencies ; and holly particularly in the slowness of its growth. This, though in a less degree, is also chargeable upon them all : but the elder is the quickest of any shrub in its shooting ; and it will bear planting so large, and take root so easily, that it may be called an immediate fence.

The flowers and berries bear a price at market ; and the wood of the old stumps is of sure sale to the turners. From all this we shall find, that there is great reason for naming the elder among hedge shrubs, for it equals any of them in value.

It has another benefit, that it is not so liable to be crop'd by cattle, for they do not like the taste of its leaves. It is not proper for all occasions, nor will grow on all soils : it will answer only particular purposes, and will take root only in tolerably good ground : yet where it will, nothing answers better.

Elder makes a good fence for gardens, because it is quick, ready, cheap, and affords so good shade. Where fields are not liable to many accidents ; where the banks are high
I and

and good, and the cattle are used to be quiet in them, it succeeds in the same manner; and for shade and shelter, scarce any thing exceeds it.

The farmer needs not have the trouble of raising plants from seed, nor of laying them with that toil and regularity, as in the making up the bank of quick: it will grow if any piece of it be stuck into the ground.

Let him cut a number of elder poles, eight foot in length, and of the thickness of a child's wrist. These he is to stick into the earth of the bank, not upright, but slanting; and when he has placed a row at convenient distances, slanting one way, he is to set another row in the spaces between, slanting the other; the poles will thus form a kind of chequer work in lozenges, and they may be secured, by tying them at the joints; and here and there fastening them to a strong post.

Nothing more is necessary, if the soil be good: the poles being thrust a foot into the ground, will take root; and immediately begin to shoot: and the leaves by their bigness will soon afford a perfect shade and shelter.

There is beauty in the regular disposing of these poles. In the plain way already mention'd, the diamond work is pretty: but by cutting some in shorter pieces, and disposing them accordingly in the planting, they may be made into many of the figures of those Chinese fences, so much admir'd at this time.

The best season for making an elder fence is the beginning of March: if the weather be dry, the poles should be water'd half a dozen times after they are stuck into the ground, which will make them strike root more readily. They need no other care but cutting to keep them within bounds; for they are of so very free growth, that unless this be done, they will soon exceed their intended compass: nothing cuts so easily; and no shrub bears it better.

These are the advantages of an elder fence; 'tis fit we name also the faults: for the farmer is not to be tempted into inconveniencies, without being fairly told of them.

We have mention'd the weakness of the elder, and its want of thorns; it is not to be trusted where cattle will be tempted to break through, for it will not prevent them. As the holly is the strongest and most impenetrable of all fences, this is the weakest and easiest broke.

Another objection is, that the bottoms in this fence grow naked after a few years. As to the first, we must allow the
elder

elder is not fit in such cases; but to the other, there is a short answer, and an easy remedy. As the elder grows readily, it is easy to stop these gaps by fresh plants, as soon as they appear. Nothing more is necessary, than to cut off some strait sticks from the trees where they can be spar'd, and plant them in the lower part of the bank, with their tops just reaching to the naked place. The planting of these sticks is no more than thrusting them into the ground, and as nothing can be so easy, nothing is more certain.

The flowers of the elder, as well as the berries, are useful in medicine, but they have so strong a smell, that they are apt to give headaches. This is an objection against the elder, very near a house. But it reaches no farther. The wood, leaves, and young shoots of elder, have all a disagreeable smell also, but this is, not unwholesome.

As the berries of the common elder are black when they are ripe; there are some kinds which have them white, and others on which they continue always green, even when mellow; but these are trifling variations, and little worth regard. There is also a kind of elder that differs from the others in the leaves, and is worth the planters notice. I don't mean by this, those idle and sickly variations of the elder, with leaves spotted with white, or yellow: the kind I mean is, that elder which has the leaves finely cut into small divisions. One meets with trees of this here and there in most counties of England: and I would advise the farmer to plant a parcel of these by way of stock, whenever he shall find it convenient to have an elder fence; this kind of elder has always more branches than the common sort, and they are stronger. The leaves also are much more beautiful; and the wood is more solid, and is preferable to box for many fine works of the turners.

C H A P. XXI.

Of the use of the crab, fallow, bramble, and alder in fencing.

WE have gone through the several shrubs commonly used in fencing; but there remain four to be treated of, which, though seldom employ'd alone, yet as they assist, on different occasions, ought to be named.

I have, in some few places, seen entire hedges of crab; and they are very beautiful for the regularity of their growth. They give the inclosure the look of a garden, when they

are in blossom; and they have a pretty effect when in fruit. Neither are they without their farther value: for the wood is hard and serviceable; and from the fruit is made verjuice.

With all these advantages we do not advise the making entire hedges of it, for they are neither so good for shelter or fence as others. The leaves of the crab are larger than those of the white thorn, but they are not so numerous; and 'tis the same in the branches. The great quantity of branches and leaves, gives the white thorn the preference above all other shrubs for hedging.

If the farmer shall chuse from fashion or fancy, to have an entire hedge of crab, his method is to be the same as for the white thorn. Let him set apart a piece of poor ground for a nursery. Let him there sow the seeds of the crab, with the pulpy part of the fruit about them.

When the plants are of the thickness of a man's thumb they must then be taken up, a bank prepar'd, and the whole managed as in the making a quickset hedge of white thorn. This is the method with crabs alone, but the better way of using this shrub is, by mixing it with white thorn.

The farmer should always, in his little nursery for hawthorn, have some crabs rais'd from the seed. Let these be taken up, together with the white thorn sets, only in a small number; and laid in just as the quicksets are. About one in every twelve, or fifteen foot. They will grow up with the white thorn; they will shew very beautifully in the mixture, when in flower, and when in fruit; and the proper use may be made of the fruit for verjuice: there will be a sufficient plenty of them for any moderate use.

Some plant a fallow among the quickset, at every fourteen foot, in the manner that crabs are here directed: and in proper soils this does well. It is of the willow kind, and loves moisture, though it does not require so much as the common willow. It is best to plant this more plentifully in moist meadow fences, where, by its quick growth, it is of considerable advantages.

Brambles are so far of the nature of furze, that they will grow upon a very poor soil: but it is not the custom to make fences of them alone; nor are they fit for it: the length and weakness of their branches is such that they cannot keep themselves upright. They are of good use planted on loose banks, to defend them from being overrun and trampled down by cattle. They also may be us'd
to

to stop gaps in the bottoms of hedges. These may be rais'd with great ease from the seed; or cuttings will grow readily. We have named the only use they are fit for, but that is not sufficiently regarded: nature often supplies the defects of hedges with brambles; and 'tis a shame art does not imitate her.

The alder is a water shrub, and its use in fencing is of a peculiar kind. It defends the sides of meadows against being wash'd away by swift running waters. The alder never grows so well as by the sides of these rivulets: the streams frequently undermine their banks, especially at the turnings: but the roots of a good alder are a sure defence.

There is scarce any shrub whose roots are so numerous or stout; and it is always sending suckers from the lowest: so that where there is ever so swift a current, or ever so many turnings follow one another, nothing is more needful to preserve the ground, than to plant a sufficient number of alders. In many places, where the course of the river is strait, the soil of the meadow is so loose and mellow, that it is continually washing in, and the water widening its channel. Here alders being planted along the strait bank, they preserve it excellently.

CHAP. XXII.

Of the bank fence, with its plantation.

IF our intent were to recommend to the farmer the bank fence alone, and naked, as it is used in some places; we should have inserted the rules for making it just after the ditching. But the bank alone is a poor, raw, and ugly fence, compared to it, with its plantation. The manner of planting quick has been shewn already: the husbandman has his little nursery of sets, not only of hawthorn, but of crab, sloe, and whatever other shrub is useful in fencing. We have now the making of the bank to describe; and the manner of disposing the sets upon it.

The bank is most proper, as an inclosure, for meadow and pasture grounds; and the farmer should consider the nature of the soil, before he attempts to raise it. Two things recommend it to him, it may be made cheap, and in a good soil will flourish; but not otherwise.

An earth that will cut easily by the spade, and is cover'd with a thick turf, is the only one fit for this purpose. We speak not of those banks of dirt rais'd by digging a ditch.



The Bank Fence planted

The Wall Fence Planted



Coppice Wood regularly planted

Coppice Wood rais'd irregularly



Timber Trees rais'd in Rows, with the Ground till'd between.

Compleat Body of Husbandry

ditch, piling up the earth : but of the fine green bank fence which is used in some counties, and deserves to be used much more ; which is beautiful and profitable ; and remains for ever.

When the farmer finds in his pasture ground soil, cover'd as just mentioned, let him set about his bank in spring, when there have been moderate rains. In very wet seasons the earth works untowardly, and in long dry weather it not only crumbles too much, but if the bank be rais'd at such a season, it will swell and burst, after the next rains.

Having chosen a proper spot of ground, and a fit season, the work is to be thus executed. Draw a couple of even lines, at three foot and an half distance all the way from one another. Then begin to dig up turf in a place cover'd with good strong and fresh grass. Cut these turfs a span deep, of a long square form, and of such bigness as they may be most conveniently managed : as these are cut up let them be laid in two rows, one along the edge of each of the two lines, with the grassy side outwards, with the space vacant between them.

A foot distance from the outermost row, not toward the pasture, open a ditch three foot wide. Let it be dug sloping, and carry it to such a depth as shall be necessary to supply a proper quantity of earth to make up the bank, between the present and succeeding rows of turf.

The earth which is dug up in this ditch, is to be laid in the vacant space between the two rows of turf, just named, till it is brought to a level with them. The foundation of the bank is thus laid, and the work will be continued easily.

More turf is to be cut like the former, and a second row on each side is to be laid on the first : placing it even, but a little inwards ; for the bank is to be rais'd all the way with a slope, so as to be broadest at the bottom, and somewhat narrower to the top.

A second-double row of turf being thus laid, the space left between them is to be fill'd up evenly with more earth from the ditch : the surface must be well press'd down with the spade : and left perfectly level, to receive the third row, and the earth between.

That the work is to be continued in the same manner, laying on more rows of turf on each side, and filling up carefully the space between with earth ; and continuing it

slanting all the way, till it is four foot high, and at the top its breadth is two foot and a half.

The space between the two last, or top rows of turf, is not to be fill'd up so perfectly as that between the others ; but the crown is to be finish'd with a slight hollow.

When the bank is thus rais'd plant the quicksets upon the top. Let them be taken out of the nursery at a proper size, and set a foot deep in the crown of the bank. They may be of any of the before-mentioned kinds that bear transplanting, as crab, white thorn, or sloe, but in general the white thorn is best. It may be diversified here and there with the crab, or fallow, but no timber trees, or large growing fruit trees are to be placed among it.

The quick will flourish better in this than any other plantation. The hollow at the top of the bank is to be preserved in the plantation, and will detain the rains, and send them down to the roots of the quick. There is a fine bank or bed of earth for them to grow in, which is thicker all the way down, and has been well stir'd and broken ; so that it is in the fullest perfection for supplying the plants with nourishment.

When the bank and its plantation are finished, a small dead hedge must be made near the top, to keep the sheep from running up and nibbling the young quick. These hedges need not be above fourteen inches high, and no matter how slight : for they will soon be needless ; the quick growing very fast, and the bank becoming every day more and more firm, by the joining of the grass roots from the several turfs, so as to be in no danger of hurt from their trampling, or any accident whatsoever.

In the autumn following let the husbandman look over the hedge, bank, and quick, to repair what may be amiss : it is rarely any repair is wanted, but if there be the least damage it should be supplied, for this is so beautiful a fence that it is unpardonable not to keep it entire.

If there be any defect in the hedges, let them be supplied with small bushes of black thorn : if any turf look decaying, let it be supplied with a fresh one cut from the same ground : and if any of the quicksets have fail'd let them be replac'd by others, that all may be without blemish.

In general, if the fence have been made according to these directions, it continues without fault, and improves every day in strength and beauty.

The

The rains at this season supply the turf and quick with moisture ; and while the former shoots briskly, the other continues in its verdure. The fresh roots of the grass which push every way, join the turfs together so, that they quickly form one body, not a joint being any where seen : and in a little time the roots of the white thorn, spreading thro' the whole substance of the bank, bind all together into one tight and solid body, that nothing can injure it. The grass continues to grow freely on the slope of the fence, and is a great beauty : the crowning of the hawthorn, varied with the other shrubs, which always look fresh and healthy, adds to the grace of the whole, and makes it far exceed any other fence.

If the ground be pasture on both sides ; instead of a ditch on the outside, the earth each way may be lower'd with a slope of two foot deep. This will answer the purpose of a ditch, in supplying a quantity of earth to fill up the spaces between the rows of turfs ; and the bank from four foot will be made by this a fence of six foot high, beside the hedge at the top : and no ground will be lost for pasturage ; for this hollowed place will bear grass like the rest ; and so will the sides of the bank, which will, in good seasons, be as green as any part of the inclosure.

If the fence be requir'd higher, the husbandman must begin with a broader foundation ; and cut away the ground more at the foot, or dig a deeper ditch for a supply of earth : for the method of carrying up the bank is to be the same : and the higher and larger the bank is, the better the quick will grow.

No hedge affords so fine a shelter as this, with its plantation. The shrubs stand more exposed to the winds on it, than any other way ; and for this reason they should not be left to grow too large. Some clip the quick upon these banks, which is a very good method, for it at once thickens the body, and keeps it in due compass : and though, in general, the clipping of trees be a very ridiculous invention, it may be allowed, in this case, with use and propriety.

CHAP. XXIII.

Of the wall fence, with its plantation.

THE wall fences of fields are so far like the banks, that although they are frequently used singly, they never have half their beauty, or value, when they are so made. Their plantation giving them their greatest advantages and superiority over other kinds.

In many parts of England stone lies so ready, that it is the common material for fences: walls, as they make them in such places, come surprizingly cheap.

The most plain fence of stone, is the wall they build in Northamptonshire, and elsewhere, where the stone is at the surface. In these places they lay a parcel of these rough stones upon one another, without mortar, till they have rais'd what they call a wall. This is so loose that one may see through it: and where the eye can pierce, the wind very well may; so that these walls are but a very indifferent fence by way of shelter; nor indeed do they deserve a much better character in any other respect, for they are so ill put together that they are frequently tumbling to pieces. They are easily repaired again, by laying the stones in their places; but when the walls are made, as some are that I have seen, the work is endless.

A second kind of walls are such as are built upon the grounds of more careful husbandmen in the same counties. These are made of the same rough stones, pil'd up on one another without mortar; but they are laid so much more carefully, that the wind does not blow through them in so many places; and the top stones are bedded in clay by way of mortar. Their better disposition in the body, and this little strengthening at the top, makes these much superior to the former: they defend the crop and the cattle better, and they are not so continually falling to pieces. The difference of labour in the building of these is so trifling a consideration, in respect of their superiority, that I have been surprized to see so many of the former, and so few of these. The one falling every where, and the others tolerably firm.

A farther improvement of these rough walls is by throwing in a quantity of tough loamy earth among the stones, as they are laid. This is a rough imitation of laying the stones in mortar; and adds but a little to the expence, while
it

it encreases vastly the goodness of the fence. A wall of this kind, with the great spaces filled up with loam, and the top tolerably laid in clay, will stand a great while, and answer all the purposes of a fence better than either of the former, by many degrees.

It may be natural to suppose, that the wind blowing through the holes in these rough walls, would be no more hurt to the cattle than what comes through the bushes in a common fence: but experience shews it is much more mischievous. The wind that blows through bushes comes broken and in a weak manner; but that which issues in at a hole in a wall, has a draught and current.

In the more northern counties, where there is plenty of a flat stone, they build these fences better: in some places, where the stone rises in large even pieces, a wall built without mortar, and only top'd with some smooth ones, in clay, stands a great while, and must be confess'd a good fence.

But a much better may be made, even where the stone is worst, upon the principle of the bank fence, just describ'd. This is what we recommend to the husbandman, where he has the proper materials.

Let him chuse the evenest and most regular stones he can meet with. The preference is not so great in the making this fence, as in the raising a single wall; but the evener the stones the better, and it is worth while to be at some care in every circumstance, about a fence that is to be at once beautiful and lasting.

Let him dig up the ground a little depth for a foundation, and open a pit, or ditch, in some place near, whence he can have a supply of earth as he shall want it, in carrying up the wall.

He is to make, as it were, two walls in one, laying the stones one upon another, first two, and then one between.

As the wall is carried up, the space between is to be fill'd with the earth. This brings all the work into one mass, and adds strength and firmness.

The stone work is to be continued, and fill'd up with the earth to such height and breadth as is necessary; and from time to time the stones are to be beat in flat at the sides: this gives the work strength, as well as regularity.

When the wall is carry'd to a proper height, let there be quicksets of any kind planted upon it, in the same man-

ner as on the bank fence. These will grow excellently, and in the aspect of a wall crown'd with a thriving hedge of shrubs is particularly pleasing.

This is the finest, best, and most lasting of all the stone fences. These walls are not uncommon in the west of England, and they plant not only common hedge shrubs, but ash, elm, and other timber trees upon them. To this we object, because the force of the winds upon such trees, when they are of any considerable growth, is too much to be trusted, where the two walls are to stand the stress: I have seen a very well made fence of this kind torn to pieces for eighteen foot length, by the blowing down of a middling ash that stood upon it: when the trees are larger, the danger is greater in proportion: nor is it either needful or proper to run the hazard.

The best way is to plant the top of the wall with white thorn sets, taken at a fit age from the nursery; and for variety, to add a crab every twelve or fourteen foot.

No stock whatsoever is equal to the crab for the grafting of apples; and in places where custom has established the property of these fruits in hedges, this should be always the use made of the crab shrub. But where people have been us'd to strip fruit trees in hedge rows, they will not only take the fruit, but tear down the hedge to get it.

In such places the crab is to be left to itself. In other counties, where fruit stands quietly in the hedges, the farmer should order his crab trees in the following manner.

Let him prune them up every season, till they are above the reach of cattle, and then graft them with the most useful and valuable apples.

Nor should we omit to mention the practice of a gentleman in Devonshire, who lately on one of those wall fences, rais'd apples instead of crabs, at certain distances between the white thorn: it was a matter of curiosity more than use; for the best method for those who intend to have apples in their hedges, is to raise crab stocks, and graft them: but as it succeeded to his wishes, I shall mention the method.

Instead of crab seeds he sowed the kernels of some good kinds of apples in his nursery; and when he planted quickset upon any of his walls, placed one of these young apple trees at every twenty foot. He planted an apple set of at least three years growth more than the white thorn,

thorn, so that it had the advantage of them in that respect ; and he planted these with care, and pruned them up, so as to give them all possible advantages. The consequences was, that he was able to shew apples that the most experienced cyderman did not know how to name. The shoots from seeds in all vegetables, are those that yield the varieties ; and by raising all these that way, and by the benefit also of the peculiar situation in which they were planted on these wall fences, he never fail'd to have here and there what they allowed to be a new kind. Some of these he brought afterwards into his orchard with success. The graft kinds, however, always bear sooner ; and in that practice a man is sure of his kind, whereas in this other method all is hazard.

End of the THIRD BOOK.



A
COMPLEAT BODY
OF
HUSBANDRY.

B O O K IV.

Of Coppice Wood, and Timber Trees.

IN THREE PARTS.

I. Of COPPICE and other SMALL WOOD.

CHAP.

1. *Of raising a Coppice from Seed.*
2. *Of raising a Coppice by planting of Sets.*
3. *Of the managing and ordering a Coppice in its Growth.*
4. *Of felling of Coppices.*
5. *Of Pollards, or Trees for Shrowding.*

II. *Of the Management of* TIMBER TREES.

6. *Of Timber Trees in general.*
7. *Of raising Timber Trees from Seed.*
8. *Of propagating Timber Trees by Transplantation.*
9. *Of transplanting Trees of a large Growth, and at improper Seasons.*

III. *Of the several Kinds of* TIMBER TREES.

10. *Of the Oak.*
11. *Of raising the Oak by Transplantation.*
12. *Of raising the Oak from the Acorn.*
13. *Of the Uses of the Oak.*
14. *Of the Growth of the Oak.*
15. *Of the felling of the Oak.*
16. *Of the seasoning Oak, and judging of the Timber.*
17. *Of judging of the Oak as it stands.*
18. *Of the Elm, its Kinds, and proper Soil and Situation.*
19. *Of the Propagation of the Elm.*
20. *Of the Uses of the Elm in Plantations.*
21. *Of the Value of Elm in Timber.*
22. *Of the Ash, its proper Soil and Situation.*
23. *Of*

CHAP.

23. *Of the Propagation of the Ash.*
24. *Of raising Ash in a Nursery.*
25. *Of raising Ash, where it is to stand.*
26. *Of lopping and felling the Ash.*
27. *Of the Uses of the Ash, its Value in Plantations, and as Timber.*
28. *Of the Beech, its Soil and Situation.*
29. *Of the Propagation of the Beech.*
30. *Of the Uses and Value of the Beech.*
31. *Of the white Poplar, its Soil and Situation.*
32. *Of the Propagation, and Uses of the white Poplar.*
33. *Of the black Poplar.*
34. *Of the Aspen Tree.*
35. *Of the Sycamore.*
36. *Of the Lime Tree.*
37. *Of the Walnut Tree.*
38. *Of the Horse Chesnut Tree.*
39. *Of the Chesnut Tree.*
40. *Of the Service Tree.*
41. *Of the Quickbeam.*
42. *Of the Birch.*
43. *Of the Hornbeam.*
44. *Of the Maple.*
45. *Of the Cherry Tree.*
46. *Of the Pear Tree.*
47. *Of the Hazel.*
48. *Of the Buck Thorn.*
49. *Of the Alder.*
50. *Of the Willow.*
51. *Of the Ozier.*
52. *Of the Sallow.*
53. *Of the Fir Tree.*
54. *Of the Pine Tree.*
55. *Of the Juniper.*
56. *Of the Yew.*
57. *Of the Box.*
58. *Of the Cypress.*
59. *Of the Cedar.*

INTRO-

THE INTRODUCTION.

Of the improvements made by planting.

THE planting of hedges, and of the fruit and timber trees interspersed among their bushes, leads us to the raising of trees, and shrubs in general. We propose in all articles to inform the husbandman how he may increase his profits, and improve the farm which yields them : and that can in nothing be more assisted, than by the judicious and orderly plantation of trees.

We shall begin with raising, managing, and felling of coppice wood, because that is nearest to the hedge shrubs last treated of ; and thence we shall advance to the culture of timber trees.

There is no step the husbandman can take in planting, that will not add to his yearly income ; and be an enriching of the land : and all he does in this way gives him also pleasure. It increases the beauty, as well as value of the ground.

It is the peculiar happiness of these plantations that all soils bear them. There are lands too wet and too dry for tillage : yet on both kinds of these trees will grow. They must be suited properly to the soil, and exposure ; and they will then yearly increase in value.

In Norfolk, there are many valleys naturally rich and fertile, but lying at the foot of sandy hills, they are overwhelmed with that barren material by every wind, and violent shower. They have in some places begun to sow upon the sides of these hills, French furze. This grows so freely, that once in three years it is cut for fuel, and all the time fixes the surface, and preserves the meadows below.

As there are shrubs appropriated to the driest sand, there are others to the wet sides of rivers. These will be describ'd in the succeeding chapters ; and we shall shew, that no piece of ground need be left unus'd, since some tree or shrub will grow on it ; and the meanest of them will yield very considerable profit.

The benefit of these plantations, is not confin'd to this present advantage, they improve the land on which they grow. The planting a copse upon an unfruitful piece of ground, is an excellent method of improving the soil. In my neighbourhood, one of the barrenest spots after yielding a great profit from the coppice wood rais'd upon it, became
a very

a very good and fertile field upon the stubbing up the roots.

Where land is so ill suited to corn or grass, that it requires a great expence to produce a tolerable crop, it is better to plant it with coppice wood. The annual profits will be greater, and the expence in a manner nothing. There are pieces of ground too remote from the farm, or from the sources of the manure, and tillage; these cannot be dress'd for corn, but at a great expence, because of carriage: these afford another reason for planting; and the profits are greater than any will believe who have not experience.

The land owner is greatly concern'd in this. In many parts of this kingdom there are lands, that cannot be let for more than five shillings an acre. How much would it be to the advantage of the proprietor in this case, to plant them with coppice wood. At twelve years growth the produce may very well be worth twenty pound the acre; and at a second felling but seven years afterwards as much: for the roots being more establish'd shoot faster.

There is greater security of the profits in this, than the common articles of husbandry, crops fail sometimes, and stock will die. Here nature does the whole business, and is out of the reach of accidents: nor is there any difficulty in making the profits annual, and as regular as by any other course. Suppose a coppice of thirty acres be planted and divided into ten parts; one of these, after a due period, may be felled every year: and by this management, each year will yield three acres of ten years growth.

A little management is all. The husbandman who sets out without it, will be perplexed with the least difficulties: he who begins properly will overcome the greatest.

He who shall see the profits of this practice, is not to suppose because barren lands will bear coppice wood, only such are fit for it; nor is he to grudge the putting such as are better, nay, even the best to this service, or to suppose the price of the rent a drawback over-proportion'd to the advantage: the truth is just contrary. Though bad land will bear wood; good land will produce it much better, and the growth will be quicker; so that the benefit will be many times greater than the cost.

The better the land, the larger will be the profit. I have read with surprize, of a plantation upon a tolerably good land, that at eleven years growth afforded wood to the

the amount of sixty pounds an acre : but I have now seen it verified. A piece of rich ground planted with flourishing sets, will yield at eleven years, pole wood, and spar wood, and some quantity of small building timber.

The raising of coppice wood and timber trees in woods, is not the only advantage to be made by planting. There is scarce any place where some tree may not be set, and there is none that does not bring certain advantage. Trees planted in waste places, those of avenues, and those in hedge rows, all yield a certain and a regular profit.

The time of the growth of wood, is one great objection, some timber requiring forty, fifty, or more years to bring them to a condition for felling ; but though slow, it is certain. Who would grudge to set a plant that costs him in a manner nothing, and without requiring care or trouble, will in fifty years be worth four, five, or six pounds. Who would grudge the trouble of planting a thousand such, which should at the end of that time be worth a moderate fortune. What an easy way is this of adding five or six thousand pounds to an estate : and where it is of any tolerable extent, what is the difficulty of adding instead of five or six, fifty or sixty thousand.

Nobody grudges this trouble, but all neglect it. Men do not look into these things till a certain period of life ; and then they think they are not to expect to live for the advantage. Perhaps not : but why should they deny this benefit to their heirs ! is there any way so easy of raising fortunes for younger children. It is so certain of success, that 'tis a crime to neglect it : and the nation as well as families suffer by the fault.

Even to those who are so selfish, and will not speak a word, or give an order for their heirs, the plantation of coppice woods may be recommended as warmly as any other practice ; because they may reasonably enough, at almost any period of life, expect time to reap its benefits : and these, although not so great as those from timber, are enough to tempt the coldest imagination.

As to the plantations for longer growth, every day gives instances of their value. Things intended for ornaments becoming in this course of time great additions to estates. How common is it to see the trees of a long avenue, which were planted only to please the eye, of such a value, as warms the next heir's heart. Others might as well have been planted, in waste places, as these for ornament ; and
he

he is ready to curse his parent who did not do it. Let him do for his son, what would have been so acceptable to himself.

Between timber trees and coppice wood, is another kind, those that are set for shrowding. The ash, and many others, serve profitably for this use. In general the trees that are of quickest growth are fittest for this purpose; and they must be suited to the soil, the willow and poplar for moist places, and so the others as they naturally require.

These are to be planted by ditch sides, in hedge rows, and on waste grounds: and they are to be shrowded according to their kinds, at six or eight years growth. After this they constantly bear a good head, and the shrowds increase for every following cutting. And they are secure from injuries of all kinds, and need no fences.

As the shrowds are used for fire wood, the profit from these trees is greatest where that is scarce; but there is no place where it is not enough to be desirable.

Beside the immediate and proper value of trees in woods, coppices, hedges, or single; they add to the value of the land about them, as is seen every day, and confirm'd by universal experience. Hedges are of vast use by their shade and shelter. Woods, when they stand on the edge of some piece of land, that would otherwise be exposed to destructive winds, must be of much greater; because being thicker, they are a more certain defence. The single trees, and those in hedge rows, afford shelter for cattle against winter storms, and summer heats; in any plantation they afford the husbandman timber for his necessary occasions; for the repair of his buildings, and for his chimney. The mast bearing trees yield food for swine; and, there is not one, that has not its secondary uses.

The necessity of wood where there are iron mines, and those of other metals, is also sufficiently known. Nothing is so easily rais'd, and no soil but will bear it; why then will not those who are so deeply interested in its growth, raise it in such places.

BOOK IV. PART I.

Of coppice, and other small wood.

CHAP. I.

Of raising a coppice from seed.

WE have divided plantations into those of coppice wood, and timber trees; and we are to treat of them separately, because they require a distinct management. We shall enter first on the consideration of the smaller, and thence advance to the larger kind; and first shall give rules for the raising coppice wood.

This may be done by sowing or by planting. We shall lay before the husbandman both methods, with their advantages; and direct him in his choice, from the result of experience in both kinds.

Any piece of land, even the most barren, will bear trees; and the farmer will do well to plant on all such places: but he is not confin'd to them. He may take in a piece of barren ground; or he may use such as has been tilled already; the wood which is produced will not let him be a loser.

If the ground be to be taken from a common, the first thing is to enclose it with a good fence; there is no produce among which cattle will do so much harm.

If it be a field inclosed already, he must repair the fences, that they may keep out all kinds of cattle. This expence may appear a disadvantage; and the preference be given to the plantation of trees, for shrowding or pollards, which yield a great deal of small wood, and need no inclosure; but those who have experienced both, find the quick growth of coppice wood makes ample amends for the charge.

When the ground is fenced in, let it be prepared by three deep plowings, to refresh and break the mould thoroughly: or where the quantity is not too great, dig it well up with a spade. Trenching it throughout two spit deep, and casting the upper part of the soil undermost. It has been found by experience, that in ground thus prepared, the trees shoot in a manner greatly superior to all that can be seen in any other way.

Which ever method is taken, the soil must be made very fine: if it be plow'd, it must be extremely well harrow'd

row'd afterwards ; if dug with the spade, let the rake come after, and the whole be laid as fine as the beds in a garden.

If the soil is tough, it will require more working, where more mellow, less will do ; there is no laying down particular rules on this head. Whatever be the soil, it must be prepared by frequent turning and breaking : never let the husbandman slight over this part of his work, for all his future success will depend upon it.

The best soil is a good loamy earth, which is deep ; for, though trees shoot fast and freely in a shallow soil, they do not thrive upon it afterwards. However, such is better for coppice wood than for timber trees, because as they are for a longer and larger growth, their roots must pierce deeper.

A loamy soil is here prefer'd to any other for the growth of trees in general. Because it is of a mix'd nature between the sandy and clayey, and will agree with such trees as are suited to either of those kinds. None gives passage to the roots more freely ; yet, it has a body that preserves and fastens them.

Dressing and fencing of the soil for the coppice being thus understood, we are to consider the several kinds of seeds, and manner of sowing them.

A coppice is not to be entirely destitute of the timber kind, for standards, tho' it is in general to consist of such as are of smaller growth. Among these the principal are the hazel, the wych elm, the birch, the flowering ash, the common ash, the elder, the hornbeam, the maple, the service, the crab, the chesnut, the cherry, the white thorn, and black thorn, the willow, and the fallow.

Some of these delight in wet soils, as the willows and alder, others in dry or in middling ground ; this will be explain'd, in treating of the several kinds ; but the planter must have it in his mind in general, and direct himself accordingly.

If his ground be damp, let him raise such kind of trees on it as flourish best in the wet : if it be dry, let him select such as love those situations : and if it be in part wet, and part dry, suit the growth to each part ; setting in those places which are wet, the kinds that love moisture, and the others in the dry. He is in every respect to promote the free growth of the plantation, and nothing will do this more effectually, than suiting the kind to the soil.

When he has consider'd his ground, and determin'd what kinds

kinds to raise, he must seek for the seed. Let not any be dishearten'd at the strictness of every article in preparing for raising of copse. There is no great difficulty in performing it; and the success will be proportion'd to the care. Where we see some of these plantations thrive excellently, and others miscarry; 'tis owing more to the care that has been taken in the preparation of the ground, and choice of the kinds, and seeds, than to any natural excellence or defect in the place.

To be sure of the seed, the husbandman should never buy it, but save it himself. There may be fault in bought seed, which he will prevent in that he gathers; because he knows how much depends upon it.

We recommend no strange or scarce trees for the copse: he may find enough of the several kinds in his neighbourhood, and may gather the seeds easily.

Let him take them from a healthy, and flourishing tree. Let him suffer the seed to hang on this till ripe, and then gather it by shaking the boughs. When he has got a larger quantity than he shall want, let him look it over, and pick out of it such as is clean, sound, firm, weighty and bright.

When the seeds are pick'd, let them be put into large garden pots, with some sand, and set by in a tolerably dry place for the winter. They might be sown in autumn as nature scatters them, but they would be in danger of insects, field mice, and other vermin.

The seeds having been preserv'd during the winter, and the ground well work'd, it is ready to receive them. As soon as spring is come, let him take out his seed, and spread it carefully.

Let him by all means do this with his own hand, going over the ground with a judicious eye, and scattering it equally, and sparingly. After this let it be well cover'd, and then nature is to be left to herself.

There is a great deal of difference in the time of shooting of the several kinds. Some shewing themselves quickly, others not till after several months, and some not till the spring following. This will be treated also more particularly under the distinct heads.

When the earliest shooting kinds shew themselves, if there be any quantity of weeds among them, let these be carefully rooted up, and if the season prove dry afterwards, give the whole ground some water. The earth having been
been

been broke by rooting up the weeds, will receive this the more readily.

After this, he is to wait nature's course for the shooting of the later kinds, keeping his fences in repair, and have an eye frequently on the plantation, to prevent mischief, for nothing is so easily hurt as a tree in its first shoot.

When winter comes on, let him order some black thorn bushes to be spread over the young plantation; and upon these scatter a little straw where the ground is most expos'd to the winds. This will break the force of those nipping blasts, which are so fatal to young roots of trees.

The summer following let them be kept clear from weeds; and as the winter comes on let a few black thorn bushes be scatter'd over the ground, but more lightly than at first, to defend the young shoots of those seeds which have not appear'd till the last spring.

The next summer let him go over the ground, after a thorough weeding, and draw some of the shoots where they have risen too thick, planting them in places where they have risen thinner; and after this having once more look'd to his fences, he may leave all to the course of nature: not doubting but that he will have a growth of coppice wood in every respect as much exceeding that of his neighbours, as the care he has taken has been more.

In the ordering this coppice ground, we have given the husbandman directions to employ more trouble than is generally allow'd: but he will be well paid for it, in the speedy growth, and quantity of the wood.

Some raise a coppice from seed, by sowing the several kinds of shrubs with their corn. I have seen it try'd, but the event has not answer'd many. The young shoots have always suffer'd by being trod upon in the getting in the harvest, and though the stubble being left standing, affords some shelter for them the following winter, it is but very poor in comparison of that regular method here propos'd.

There can be no objection rais'd but it's expence: this, if it were great, would be answer'd by the increase; but in reality it is not. The care is more than the charge; and what seems much here in the directing, is little in the working.

C H A P. II.

Of raising a coppice by planting sets.

WE have shewn a method of raising a coppice from seed; and we shall propose as candidly the other way of doing it by sets.

One natural objection against the way of doing it from seed, is the loss of time. The sets, or young trees, cost little, and are advanced some years growth when put into the ground. This objection, though it hold true of some trees and shrubs, does not of others. Some will take at once, and shoot strongly upon the removal; but others will be so much the more slow for it, that it has been seen of a seedling tree, and one transplanted, that the former has in a few years overtaken the latter, though it was of seven or eight years growth; and has continued shooting stronger for many years after, though the soil, situation, and exposure, were the same to both, and all other advantages equal. Worlidge, an author of veracity, asserts, that a walnut set into the ground, shall overtake a tree of ten years growth planted at the same instant.

One thing more is to be observ'd against the way by planting: as it will be prudent to have some timber trees in a coppice, these rise much best from seed, because the shoot is always straiter, and grows more regular, and this is a vast article, their value being, when grown, in a great measure proportion to it.

Shrubs, and the lesser trees, bear transplanting better than those which grow to a greater height: and one everlasting rule must be, if transplanted, that the husbandman either raise them himself upon a poor piece of ground; or take care it be a poor piece, from whence he buys them. They will then upon being removed into better land, shoot more freely; whereas if his soil be poor, and that of the nursery have been better, they will make but a very slow, and bad progress.

In the method of making the coppice by plantation, the husbandman is first to go through all the care of raising the shrubs in a nursery, or else to be at the expence of purchasing them; and the greater hazard of their thriving. It is best he should raise them himself; we shall therefore suppose he intends that, and begin from the first article.

He must select a piece of ground for a nursery; and on his

his proper choice of this, depends a great part of his success in all that follows.

In soil it must be poor. There is scarce any ground in which the seeds of trees and shrubs will not shoot; and all that is requir'd of this place is, that it be such as will give them power to make the first shoot, and support it to a little height: for the younger they are transplanted, the better they will thrive; and that the time thus lost in other uses on the land, will be well repaid by their expeditious growth. This loss of time, and of the use of the land, is the great reason of planting, instead of sowing the ground for a coppice; but any loss so sustain'd, is repaid manyfold.

This spot design'd for a nursery, must be defended from the north and west, and open to the south east. It must be well fenced: for one breach may destroy the labour of several years, and it will be best if it lie dry. This is an advantage of the same kind, with that which is drawn from the poorness of the land: for the trees transplanted from a dry to a moist soil will always succeed; whereas, if removed from a moist to a dry they are very apt to miscarry.

The ground being chosen and fenced; let it be well turn'd up by the plow or spade, in the beginning of winter. And again early in the spring, and let it be perfectly clear'd from weeds: then let the seeds be sown in it. These having been gather'd, examin'd, and pick'd by the farmer's own hand.

The best manner of sowing is this. Let all the seeds be kept separate; and let the ground be cut up with trenches or furrows four inches deep, drawn at two foot distance quite along or across it, and in these furrows let the seeds be sown, scattering them lightly in: and sowing only one kind in one furrow. When they are in, let the ground be drawn over them with a rake, and then the whole left to nature, taking care to keep the place clear from weeds.

Two weeds in particular are to be guarded against in a nursery, the common dock, and couch grass. The dock root so deep that it cannot be torn up afterwards, without disturbing the young shoots; and the couch grass spreads so under the ground, that it will entangle itself with the roots, and rob them of their nourishment; and cannot be rooted up without tearing them up with it.

This method of sowing in a trench, is best for those which have small seeds; but for such as are larger, as it will be proper to have some of these, the best method is to set them

with more exactness and regularity. Acorns and chesnuts are best set in rows by themselves by a line. With respect to the oak, we are for planting the acorn in the ground where it is to stand, the regular growth of that tree being a great article in its value.

The nursery being thus sown is to be watch'd as the young coppice, rais'd from seed; and particular care must be taken, to keep out hares and rabbits; they will get in where there is not a breach for cattle, they will eat up a whole plantation to the ground, when it is very young; and from their gnawing it never well recovers. The particular methods of warding against this mischief will be laid down hereafter, where all the accidents to which trees are liable, will be treated of together.

The shoots in the nursery having been preserved in their tender state, from weather and other accidents; when they are growing to an age to remove for the planting of the copse, let the ground laid out for it be opened in deep and wide trenches, at twelve foot distance; in the latter end of autumn: and let the young sets be carefully removed out of the nursery, and set in these trenches.

In the nursery seeds of the same kind are sown in the same furrow, but in this transplanting let the different kinds follow one another in the same row, at moderate distances. Thus the coppice will be planted in the same variety with that which is rais'd from seed, and the trees will not only look but thrive the better.

There is great advantage in planting the young trees in rows distant from one another, the husbandman may make use of the ground between for any other growth, till the trees are of some height; and this tilling between, far from hurting the young trees, will assist their growth: and the coppice will grow afterwards with a beautiful regularity, being all laid out into natural walks and alleys. We should not name this as an article worthy the husbandman's consideration, if it interfered with his profits; but it agrees with them, for these vacant walks will, in the felling time, give the workmen room to cut and finish up their work; and good and free room for the carts to come for the carrying off the produce. At the same time experience shews, that the quantity of wood produced in the same number of years, will be greater in a coppice that has been planted in these distant rows, than in one where the trees have been set in the usual thick and confused manner.

C H A P. III.

Of the managing and ordering a coppice in its growth.

OF the two methods of raising a coppice, at once from the seed, or by the assistance of a nursery, the farmer may take his choice, according to the uses he can make of his ground while the shoots are raising in the nursery, or to other circumstances.

What I have seen by experience in the country where I live, would lead me to prefer the method by seed, where other circumstances are different; but I would not advance upon this, that the same practice is to be prefer'd every where.

The coppice being rais'd by one or other of these methods; and the trees beginning to acquire strength: the planters care, though it be lessen'd, does not absolutely end. He is to see that the coppice be duly supplied with young trees and shrubs in all parts: not too full in one place and vacant in another.

To this end he is to go over it the year after all was left settled, whether by seedlings, or transplanted shoots, and in general he will find this difference; in a coppice rais'd by sowing his business will be to thin the ground; and in that rais'd by planting to thicken the plantation in some places.

In this second as well as the first thinning of the coppice rais'd by sowing, the planter is to keep in his mind the advantages arising from planting the shoots in the other way in those distant rows. It gives a considerable advantage to the planted coppice over the sown; but this is an advantage that may in a great measure be given to the sown coppice in the manner of thinning.

Preference must be given in the taking up superfluous shoots, to the strongest and best growing; but so far as may be let the thinning be conducted so as to leave the standing shoots in distant rows. These will never be so regular as when the coppice is planted in trenches dug by a line, but the nearer it approaches to that form the better.

In coppices rais'd by sowing, not only the several first years use of the ground is lost, but also the advantage of tilling and employing the earth between the rows afterwards, which is serviceable also to the trees; but wherever I have seen the experiments made, the method by seed, notwithstanding all this, had the advantage.

Upon a full consideration of all particulars, perhaps it will appear in general, that when rich and valuable land is to be laid up for wood, the method by planting is to be prefer'd; and when ground of small price is to be employed for this purpose, then the best method is by sowing.

In going over the rising coppice for the last time, if it have been rais'd by sowing, the farmer must thin it, by taking up such shoots as shall be found ill-fashion'd, or superfluous, in such a manner as added to the first thinning, shall dispose the shrubs, though rais'd at random, from scattered seed, into the appearance of something like order and regularity.

When he makes this visit to his coppice rais'd by planting, he will find it is thickening that it wants; and this is as easily done as the other. The shoots were planted here in such number only as it was fit they should stand; and though this has been done ever so well, some will have fail'd: the places of these must be supplied; and whereas some others will be found to grow irregularly and ill, it will be best to take them up also and put others in their stead.

This is the last time of going over the plantation with that view: but if any of them are found to grow ill afterwards, the way is to cut them off slanting near the ground, and leave them to make a new shoot; which, the root having now great heart, will be very strong.

In this article of thickening a coppice for the last time, there are other methods, besides that of taking up a bad shoot, and planting a fresh one in its stead; or setting such in accidental vacancies.

There are several kinds of trees and shrubs that will grow from stakes or cuttings: and these will succeed no where so well as in a coppice of some years growth, because they are shaded, and the ground is kept damp about them as if watered.

The trees which may be planted thus, are more numerous than commonly imagin'd, the willow, fallow, osier, alder, aspen, and black and white poplar and elder, may all be thus rais'd: the time for planting the sets is early in spring. These are of excellent service for the thickening the coppice, in parts where the ground is damp. This wetness which has caused the other plantation to fail, will make these kinds thrive; for they are the proper trees for it, and will never fail. It will be proper to go over the coppice, whether rais'd by sowing or planting, in this manner in the spring,

spring, when it is of a due growth; and thus to add to it, in proper places, these kinds which love a watery soil: they will not only thicken it as to number, but advance beyond all others in those parts of the ground.

As spring is the time of adding trees, in this easy manner, the season for supplying its deficiencies with the others, if introduced from the nursery, is October or November; they are to be chosen of a proper growth; and to be taken up just after the leaves are fallen. In the removing these, as they are somewhat larger than those first planted, more care must be taken. They must be rais'd up with as much of their own earth about them as can be preserved, and only the tap roop, or downright root, is to be shortened: a large hole is to be open'd for their reception; and the roots are to be carefully and evenly spread in it, and cover'd with light mould. The whole being fill'd up, the plant is to be watered, and so left to grow.

As this method of transplanting into the coppice is much more troublesome than that of raising the willows, and other trees just mention'd, by sets; there is a middle practice between them, which may be us'd very advantageously for the thickening a coppice: this is by what is call'd among gardeners, laying of the branches.

When the husbandman sees a vacant place that wants to be thickened, let him pitch upon a good branch of one of the nearest trees on each side; and then chopping half through, or more, as is done in the plashing of hedges, let him bring it down to the ground; and opening the earth a little, lay in the branch, fastening it with two or three pegs, and then cover it with the mould that was thrown out.

Each of these branches will produce a great number of suckers, which will grow freely enough; and the vacant place will become one of the thickest spots of the coppice.

The best time for laying of these branches is the beginning of the spring, just when the sap is rising, and the buds are going to break out. If the earth thrown out of the trench, do not cover it thoroughly, there should be more added till a little hill is rais'd all along. This will forward the striking of roots downwards, and shoots upwards.

If the coppice be too thin in places, where branches from the neighbouring trees cannot be laid to thicken it; let branches of some other proper kinds, be laid in their place, for a supply of young trees, if the nursery do not afford a

competent number for that purpose. These will send up each its proper quantity of shoots, and they may afterwards be removed to places where they are wanted with little trouble.

Many trees are propagated better this way than any other, the lime, the birch, and horse chesnut particularly; and the elm very well. The young sets are to be removed in spring, and once water'd, and they will grow without any farther trouble.

The sets of willow, poplar, and the like kinds, inserted early in spring in their places, are to be cut only one way, at the end that goes into the ground.

The last article in the management of young coppices, is the cutting them down at a certain growth; not for their wood, but to increase the quantity.

Some deliver this as a necessary and universal practice; but this we do not approve, though, in part, it may be very useful.

From the main shoot when cut off, there will rise a number of others. This is a plain truth: but experience does not therefore always support the practice. When this is done, it is to be at two years growth if the coppice have been rais'd by planting; and at four years if from seed. The shoots are to be cut off within three inches of the ground, and there will rise from each many new ones, which the root will push up very vigorously, and which will soon make so many good poles.

There may be places where it will be necessary, or at least proper, to cut down the whole growth in this manner. Particularly when the soil is very poor, and the coppice having advanced so far, is seen not to prosper. In that case the cutting down the whole within two inches of the ground, will give strength to the roots, and they will shoot up vigorously from all the stems: but though particular circumstances may sometimes render this proper, it is not to be laid down as universally necessary.

Some time is lost by it; and in places where the growth succeeds well, 'tis better to let it wholly alone. 'Tis best in this case to take an earlier felling; for instance, at eleven years growth; and then to expect the appearance of these numerous shoots, which will rise so quick from the roots now confirmed and strengthened, that in seven or eight years, there will be another felling ready, richer than the first.

Perhaps

Perhaps it will be best of all to moderate the practice; and in part to follow it, whatsoever be the soil and condition of the growth, tho' very rarely do it entirely.

Thus at the third year, if the coppice have been raised by planting; or in the fifth, if from seed; I would have him go through it for the last time with a careful eye, making good all deficiencies, and retrenching all superfluities: and I would have him now take a labourer with him, with a good sharp bill in his hand. Let him examine every young tree in the coppice, and let him leave all such as grow prosperously and regularly to stand as they are, but let him order every one that grows irregularly and ill, or that seems not to thrive like the rest, to be cut down in this manner within three inches of the ground, by one slanting stroke of the bill. This practice will give strength to such roots as want it, by taking off for the present the shoot that was too much for them to feed; and it will leave the rest to continue in that prosperous condition wherein he finds them. This is the practice of reason; and this the method in which the moderate and judicious husbandman will use all those instructions which are given by people too warm in the pursuits of their particular notions, to give way to a due consideration of his interest.

CHAP. IV.

Of the felling of coppices.

WE have brought the coppice to a time and condition, in which it wants no farther assistance from the husbandman; he is only to see that the fences keep sound, and leave all to nature. The trees are too strong to be hurt by weeds; they will suffer none to live among them; except some few of a particular kind, as fern about their roots, and fanicle, betony, and some other such under their shade, which do no harm, and will not live elsewhere. The husbandman is to give himself no trouble on this head, but wait with patience till the coppice is fit for felling.

We meet with punctual directions on this head in books; and every woodman will dictate as positively: but experience is more cautious: following that guide alone, we shall tell him that no exact rule can be given on this head. The writer delivers imperfectly, what he has heard partially; and the woodman forms his judgment upon what he has seen

seen in two or three particular places, and thinks all nature is to follow that rule.

The growth of a coppice is different, according to the soil, situation, moisture in the ground; and other accidents: some very obvious, others not to be discern'd by the most curious eye. The time of felling is to be regulated according to these: for 'tis not its being of such an age from the sowing or plantation, but its being in such a condition of growth, that renders the wood fit to cut.

All that can be said with certainty is, that the earliest time at which a coppice should be cut, in whatever manner it has been rais'd, is the eleventh year. It is only in favourable soils it is fit to be felled so soon; in others, from that time the husbandman must year by year watch his growth, to see when it is in a condition for cutting down to advantage.

Twelve or fifteen years is a common age for felling; and sometimes there is a necessity of letting the wood stand longer. But this is to be understood only of the first fall; for the roots are then so establish'd, that a smaller time does for a new growth.

It is a good practice in many circumstances, to sell the coppice in parcels. For instance, let the owner begin at twelve years growth, and sell one eighth part: the next year let him sell another eighth, and so on every year, to the last. The last years felling will then be of twenty years growth; and he will find it will very well pay for the time.

Every succeeding year's felling will be larger than the last; and the difference between the growth of twenty years, and that of twelve, will be greater than will easily be imagin'd.

This is the way of making a coppice yield a regular annual income; for by that time he has felled the last eighth part; the first having had so many years for growth, is ready to be cut again; and he may thus go on year by year, so long as the roots will hold out.

The time for felling a coppice is during the whole winter; the woodman may be set to work in the third week of September, and the business may be continued till the first in March. After this, the sooner the produce is got off the ground, the better: for the owner is to consider his succeeding growth. Spring will be coming on, and the
I trees

trees will be very ready and quick in shooting from their stumps. These shoots must not be injur'd, for on their fair growth depends the value of the next fall. The sooner all is clear'd off the better; for the feet of the cattle, and wheels of the carriages, and the roughness of the brush wood will tread down, break and destroy these young shoots to a great degree, if this be neglected, until they have made their appearance, and obtain'd some length.

Let the husbandman attend the woodmen in their work, that he may see the felling perform'd to his advantage. Let him leave a number of regular and well growing trees at proper distances for timber; and see these rightly trim'd of their waste boughs, that their sap may be so directed as to feed the trunk, and carry that up even and regular.

Let the others be cut off at five inches from the ground, sloping, and with a sharp instrument; for all bungling at the stump does mischief. The success of the succeeding growths in a coppice, depends greatly on the employing a good workman, and seeing that he keeps his tools in order.

Expedition in the removing the wood, has been recommended: when all is clear'd off, he is to see the ground well fenced as at first, that it may shoot without interruption or injury. He cannot be too careful on this head; for the mischief he may suffer is very great. The coppice being thus defended, will surprize him by its shoot of the first summer, and afterwards it will grow in proportion year by year to the next cutting.

After a few seasons it will be too strong to be hurt by cattle: but if it happen either through negligence, or in spite of care, that beasts have got in and crop'd it the first year, the only proper method is to go over the shoots at the end of September, and cut them down that there may rise new ones in their place; and then to see that the plantation be better defended than before. This is always worth while: for the difference is very great between the growth of those shoots in a coppice which have received no injury, and those which have been hurt.

CHAP. V.

Of pollards, or trees for shrowding.

FROM the coppice we advance to the consideration of timber trees; but we are naturally stop'd between both, by a particular kind of growth, which is neither of the coppice wood, nor timber tree kind: this is the pollard; a tree of any sort cut off at ten or twelve feet distance from the ground, and shooting out from that part a number of branches or poles.

These branches are called shrowds, and the lopping them shrowding of the tree. These trees are raised for the supply of the fire, and other small purposes; and are cut at certain seasons, according to their growth.

Trees for shrowding, are planted sometimes in hedge rows, and sometimes in waste places: those that love water along the sides of ditches; and those that bear dryness and exposure, on commons. Such trees as love wet places, are the quickest growers, the others are according to their kinds, more slow.

Pollards are inferior to coppice trees in the quantity of wood they yield, and in its value. The coppice wood is fit for many purposes, that the shrowdings of pollards can never answer, and therefore brings a better price: but on the other hand, pollards are maintain'd at a smaller expence; for they require no fences, they take up no quantity of ground; and they are in their shoots above the reach of cattle.

The most profitable trees for pollards, are the willow for watery places; the ash for hedge rows, and the oak for commons. But each of these situations will support several others to advantage; and there is scarce any kind that may not be brought to a pollard at the owner's pleasure.

In general, the husbandman should shrowd such trees as are not fit for timber; or any from which he desires to have a present advantage, or which he intends shall supply his family, or the market, with fuel quickly and readily; for there is no growth so speedy.

Trees intended for shrowding may be raised, where it would not be worth while to have others, because of the injury they would do the ground: for, as to these, the farmer may have the benefit of grazing under them, while the tops are growing, so that little produce of the ground, where

where that is of any considerable value, is lost by their growth: and when their heads are so large that they injure the grafs, they make amends another way, for they then afford shelter for the cattle.

For the planting of trees intended to be pollards, the husbandman should follow these directions.

Let him observe what kinds thrive best in the hedges, or on the commons about his neighbourhood; and let this direct him in the choice for pollards.

When he is determin'd which to raise, let him mark out the proper places, whether in hedges, by ditches, or on waste ground; and not set them too near one another; for in that case they would only defraud each other of nourishment.

The nearest they should come to one another is forty foot. The ash may be planted nearer than most other trees, and the elm nearer than any: but between thirty and forty foot should be the nearest they are ever allowed to stand, let the soil and situation be ever so good.

'Tis best to raise them by planting, for sowing would be tedious and unnecessary. Let him take the young trees out of his nursery at four years growth.

'Tis best he take the young trees out of his own nursery, because he will take care to have that upon a poor soil, whence the trees being brought to a somewhat better, will shoot vigorously.

The heads of these young trees are not to be cut off at the time of their transplanting. If they be of the light and pithy kind, the wet would, in that case, rot the top where it is cut; and they are not yet of a due height; for the part where the shrowded tree is cut off, must rise above the reach of cattle; else they will crop and mangle the young shoots, and the shrowding will be worth very little.

At whatever age trees are planted, they are not to be cut off for shrowds till they have stood a year or two to get firm and secure rooting. The best time for doing it is in spring; and the whole care respecting the height is, that it be such as to prevent mischief from cattle.

In some cases the husbandman may find trees of a considerable growth, that he shall think it worth while to cut off for pollards; as the poplar, willow, and some others: but he must do this carefully: the best rule is, that he cut them off at some place, where there is a good side shoot to draw the

the sap ; otherwise it is often seen that a tree of this bigness perishes.

The trees being thus cut off, are to be left to nature, for the shooting out of poles or branches. These will appear soon, and grow fast : and when they are of such a bigness as to answer the husbandman's purpose, he is to lop them. With respect to the time they are to stand, no rule can be given, any more than they could about the coppice wood, because some trees grow much quicker than others ; and the same kind will require a different time to come to use, according to the soil and other circumstances. The owner's eye therefore must be his only rule : he is to consider the nature of his occasions, and to cut them down when they are fit for those uses. Observing always that in these shrowds, as in the growth of coppice wood, the value is greatly increased by allowing a year or two more in growth.

The season for shrowding pollard trees, differs in some degree according to their kinds. As to the oak and other hard wood trees, when made pollards, the shrowds may be cut any time between autumn and spring ; but it is best done in autumn : on the other hand, the willow and other soft wood trees, including the ash, should never be shrowded, except in spring ; for if it be done in autumn, the winter rains will be damaged, and often destroy the tree.

Care must be always taken in cutting off the shrowds, especially of the soft wood kinds, that they are taken off in a sloping direction, and with a sharp instrument : for in these, as in the coppice wood shoots, all haggling of the stumps does mischief. More depends upon the employing a good and careful workman on these occasions, than any one will be aware, who has not minded the several consequences.

For the last article in the management of pollards, I shall direct the husbandman to fell or stub them up at a proper time ; for they do not last like other trees that grow upright and naturally. Pollards usually, after some loppings, grow hollow and decay. In this case they not only lose their value in the trunk, but the produce of the head is less, and of slower growth.

I advise the husbandman therefore to provide for a supply in time, by planting a young tree of the same kind between every two, and shrowding it at a proper growth. When he is thus prepared let him watch his old pollards, and

and take them before they decay. Cutting them up at this time they will yield a considerable quantity of good wood: the best of it will be fit for some mechanical uses according to its kind, and the worst for fuel.

I have said these old pollards are to be fell'd or stub'd up; but from experience I altogether prefer the latter method. The price of stubbing them up will be return'd in the quantity of fire wood yielded by the root; and the young trees will thrive vastly the better, for the clearing and stirring of the ground.

I would have a quantity of pollard trees always kept up about a farm, and by the method here laid down there will be a supply of them from generation to generation.

BOOK IV. PART II.

Of the management of timber trees.

CHAP. VI.

Of timber trees in general.

THE plantation of timber trees is of vast consequence to the publick, as well as to private persons: their uses in building, and other necessary articles of life, are sufficiently known; and our navy depends upon them. Their value to the possessor is often such as to recover an half-sunk estate. So that, taking in the whole of the consideration, it is not easy to name any thing a man can do, that is more for publick and private advantage together, than planting. It is cheap, and it is easy; and it is of all methods the best in which a man can make atonement to his successors for his own extravagance. He who sets about it with spirit, should consider he is working for himself, his heirs, and posterity.

These are the natural and plain advantages of planting timber and forest trees, and yet the practice is, in a manner, lost. Neither laws nor reason are able to affect men against their immediate interest; nor will any thing tempt them to look farther. The heir cuts down wood without the least thought of providing for his heir, who may probably enough be left in real, in the place of his, perhaps, imaginary wants. We shall be happy if, by setting forth plainly, the ease of planting timber trees and their value, we can raise again a spirit for setting about that useful work,
at

at the same time that we give directions for doing it in the most successful manner.

Timber trees are planted in woods, in parks, in avenues, and in hedge rows, and they succeed very well any of these ways. They may be raised from seed either in the places where they are to remain, or in nurseries, and removed by transplantation: the latter is the more common way, but the former is the better: this I affirm from what I have seen on repeated trials. The method by sowing will seldom be prefer'd, because of its slowness; people are eager to see the effects of their labours, and the other method shows them most readily.

When timber trees are to be rais'd by transplanting, the sets must be had from a nursery: and the directions which have been given on that head, for the raising the supply for hedges and for coppice wood hold good here. The poornefs of the soil is a particular article to be regarded in this case.

The disadvantage of trees rais'd by transplanting sets, in respect of those from seed, is owing principally to some check they receive in the removal: and this is sure to be greater when they are taken from a better than from a worse soil: the only thing that could make amends for the stop naturally occasioned by this, is the removing them into a soil so much better than their own, that they should feel it instantly.

A great deal of good is to be done also, and a great deal of mischief prevented, by the method of transplanting. Of this we shall speak hereafter: but there comes here a more immediate consideration, that of the soil.

There is a great deal of difference between the plantation of the coppice wood shrubs or the pollards, and that of forest trees. The former are intended for immediate growth and immediate use; but these are to stand a long time, and on their strength and soundness, at the end of so many years, depends their value. This will be more certain in some soils than in others: those soils are therefore to be prefer'd. Trees will shoot quickest in the lighter soils; but it is in the firmer and stronger they grow to most value. An oak in a clayey ground, makes slow advances, but the timber is never so firm and sound.

We are not to infer at once from this, that clayey soils are the best for trees. A particular instance is not to be advanced into a general rule: other soils agree with other trees; and very well, though not so well with the oak.

Coppice

Coppice and pollard trees may be planted on any soil ; but 'tis not so with these. We are to look upon a plantation of forest trees as a publick benefit, and we ought to wish all possible success to those who undertake it ; and to contribute to it by all possible means. The better the soil, so much the fitter it is for large trees ; and one particular consideration comes in here, which is, the depth. The best soil imaginable, if it lie over a bed of rock, though at some considerable distance, will starve large trees : a much poorer with depth is better.

The richest and the deepest soils produce the largest and the fairest trees. The quickness of their shoot depends, in a great degree, upon the goodness of the soil, but their absolute growth to their proper bigness and strength, on its depth. If we bore into the earth where trees grow tall, fine, and regular, we shall find it always deep ; and on the contrary, wherever the soil is shallow, we shall see them stunted, crooked, and low ; with no other occasion for that alteration.

Timber trees would, in general, grow very well in our rich grass grounds : the several kinds that love a dry soil in the higher pastures, and those which love wet in the meadows ; but there is no occasion to sacrifice such land to them : the best method is to search for some place where the soil is deep, and the land is not turn'd to such account ; and then, in whatsoever form he chuses to plant them, he will make of it, in the end, a much greater benefit than of any other part, let what use will be made of it.

There is no need to be particular as to the nature of the soil, provided it have this great article, depth. In general, those which are too dry are the worst : and to name the best of all for trees in general, it is the loamy kind. No matter what be the colour : but a soil of this nature, compos'd of clay, sand, and a proper quantity of vegetable mould, and lying to a due depth, with some soft bed under it, is the ground that of all others the most universally agrees with trees.

The occasion of this preference is seen, when we examine the nature of things : if we demand what a tree wants in the soil in which it grows ? the answer is, a firmness that will give hold to the roots ; an openness that will let in the rains ; a richness for nourishment ; and a depth that it can pierce with its roots in proportion as it advances

in height : all these qualities the loamy soils have more than any other kinds.

Depth is in some degree accidental ; but in the general, loamy soils do not want it, for they are commonly thicker than others, and they usually lie upon a bed of clay which the great roots are able to pierce, while the others spread themselves in the lighter soil.

The firmness that is in the loam gives it a body ; and the sand breaks it to let in the rains : while the vegetable mould, which makes the other part of the composition, supplies its part of the nourishment. Thus loam has all the qualities of these several soils, and yet has not the disadvantages under which they lie singly : for though being all thus blended in loam they make so admirable an earth for trees, they would neither of them do well alone, except for particular kinds.

Clay will give hold to the roots, but it is cold and has not nourishment : even the oak that grows so sound in a clayey soil, expects some mixture of vegetable mould, for it does not succeed well in clay alone. Sand that has warmth enough, wants body to hold the roots. And as clay will not admit the rains, sand lets them through, so that they do not remain long enough to be of use. Vegetable mould alone, which receives and keeps the rains sufficiently, and affords such abundant nourishment, does not give a sufficient hold to the roots, because it is too loose and crumbly.

Loam possesses all the advantages of these several soils, without being subject to their several inconveniences, and 'tis therefore reason declares it to be the best. We see all trees, without exception, grow well upon loamy soils ; and most of them flourish : then, as there are certain plants peculiar to clay, which will not live in sand, and some that delight in sand and will not live in clay, so it is with trees : but in the same manner as all these plants, so all those trees will grow and thrive in loam.

The loamy soil is that which he who is about to plant for timber is to chuse ; and if he can with convenience, I would advise him to fix upon some spot where trees have not grown before. For it will be the richer, as its nutritive parts have not been exhausted by former growths.

Some advise a piece of ground on which no crop has grown ; but this is a needless caution, for timber trees seek their nourishment principally at a depth, to which the roots
of

of corn, and other of the common superficial crops, do not run.

When he has fixed upon this spot, I would advise him to use the same caution that has been recommended on the subject of coppice woods. That is, if the soil be not exactly what he could wish, that he suit the trees to it : and if it differs in some places from what it is in others, he is to use the same caution of planting in those particular places, such kinds of trees as that soil agrees with.

If his ground be throughout much inclining to the clayey, or what is called a very clayey loam, let him plant the greatest quantity of oak : if it be too much tending to sand, let him plant ash in the greatest number ; and in the same manner suit the growth to the soil.

If only some one part of the ground be clayey, let him there plant oak ; if some part sandy, let him here set ash and sycamore ; and in like manner if any spot be particularly wet, let him there plant the black or white poplar, and such other trees as love a wet soil ; the several kinds of which will be pointed out to him at large hereafter.

CHAP. VII.

Of raising timber trees from seed.

WE have observ'd that some raise timber trees from seed upon the spot where they are to remain, others in nurseries from whence they remove them by transplanting, when they have arrived at a proper growth. We shall now deliver the best method of doing each ; and the several cautions to be observ'd in the practice.

The seeds of these large trees are in general large ; and therefore are not to be sown by scattering them at random over the ground, or spreading them in trenches. They should be set in regular rows by a line, putting them carefully into the earth, and seeing them well cover'd. This is the practice when they are to be rais'd in a nursery for transplanting : but when they are sown where the trees are to stand, another course is to be follow'd, and the success is more certain.

Having fix'd upon the proper places, and distances at which the trees are to stand, a hole is to be open'd in the earth for each tree with a spade. Let it be dug two spades deep, and about two foot square. Let the earth be well broken, and put in again ; and then four or five acorns, or

of whatever seed is chosen, must be carefully set in this new stir'd ground.

Let this be done in the beginning of October : and when the ground is laid level over the seeds, lay a black thorn bush lightly over it, and then raise a little dead hedge, or a slight paling round it ; and thus leave it till the seeds shoot. This may be called a troublesome method ; and indeed it is more troublesome than the common way of planting, which spoils half the trees by neglect ; but the expence of digging for a large plantation will come to but little ; and for the rest, 'tis only doing earlier what in open and exposed plantations others do later.

If the place where the plantation is made be within a good inclosure ; and no other use be made of the ground, this care of fencing round the seed spots may be omitted ; but there will always be danger. In the method here prescribed, the ground may be used for the common purposes of husbandry, all the time the trees are growing up to a height ; and they will be defended by the first work, till they are out of the reach of danger.

No method so well gives trees the advantage of growing up for the first years in perfect security and quiet ; and the future beauty and value of the tree depend greatly on that article. The least hurt while young, may blemish a tree for ever : nay, the very blowing of the wind will sometimes do it an irreparable mischief. It is as this season only they require care, but they really require very great.

The owner will this way be sure of every step he takes : he will have a plantation, every shoot of which shall certainly thrive ; and every tree be regular and beautiful. This is the method we prefer for raising plantations of timber trees, though we shall do justice also to the other.

When the seeds in these spots have shot above the ground, let the place be kept clear of weeds, and their growth for a little time carefully watch'd. As soon as they are so far advanced that the eye can judge of them, let one be marked for the reserved plant that is to stand, and be the future tree ; and let the others be drawn up and set in hedge rows, coppices, or where the owner pleases ; leaving the favourite shoot alone to have the benefit of the ground. This will then rise at a surprizing rate, and with great regularity. But if from any accident it prove faulty, let it be taken up, and one of the best of those that had been transplanted, again removed and set in its place, watering, and shading &

shading it; which may easily be done by the means of the hedge or paling; and using every method to forward its growth, that it may not be too far behind the others.

Thus is a plantation of timber trees rais'd by fowing; and no farther trouble is requir'd about them.

CH A P. VIII.

Of propagating timber trees by transplantation.

IF the method by transplanting be prefer'd from the particular circumstances of the owners situation, which may sometimes reasonably influence him to make that choice, though naturally and generally the other is best; the following is the method to be observ'd.

Let a spot be chosen for a nursery on a poor soil; and let the seeds of the several timber trees be set by a line. When they are come up, let them be thinned, pulling up the weakest plants.

When the others are of a sufficient growth, let them be removed into the places where they are to stand, observing the following directions; on the punctual regarding of which, the success will certainly depend. All trees are injur'd by removing, but that hurt is often greater than it need be, from the improper or careless manner of doing it.

The best time of transplanting them; is when they are of two years growth. Most people do it later, but I have found fewer accidents when they were thus young, than at any other time.

Let them be taken up with care. Let the place be first open'd to receive them; and let them be brought to it with as much of the earth of the nursery about the root as possible.

Let the large strait downright root, in such trees as have one, be cut off at the end; and the hole be deep enough to receive it without bending. This is what is called the tap root; and the preserving it in its proper direction, is of great consequence to the regular growth of the tree. Let the other roots be as evenly laid in, and as little crush'd and injur'd as possible: and when the earth is put over them, let it have a careful watering to settle and fix it about them.

Care must be taken that the hole into which the young tree is set, though deep enough to receive the tap root, be not so deep as to bury the others below the best part of the soil. This is a common fault; of those who in small

plantations will be over careful. By this mistake they often set the young roots in a clay or a gravel, whereas they might have disposed them in good vegetable mould. The lodging these roots carefully in the best part of the soil, and keeping them evenly dispos'd, and well spread out, with earth between them, is a very great article: and to this purpose when the soil is very thin or shallow, it is best to keep them in it, and if need be, to raise the earth about the bottom of the tree, rather than sink that too low.

The distances at which they should be planted, depend upon the nature of the tree. Oaks should stand at forty foot distance every way: elms at thirty; and all other trees at some middle distance between these. This, and the other particular directions, will be given in treating severally of the distinct kinds; we here speak of planting in general.

In the same manner is to be understood the preference giving to sowing above transplanting: it is deliver'd of trees in general. We shall shew hereafter how either method suits best with each particular tree.

These directions will ensure success, when they are observ'd in the transplantation of trees of two or three years growth. But as it is a common, and, in many cases a very right practice, to remove such as are of a larger size, we shall set down the cautions and expedients to be used in removing them.

When a tree of considerable growth is to be transplanted, let the hole in which it is to be set be thoroughly prepared before it is brought; and in the taking it up, let there be as large a quantity of its own earth as well may be, removed with it, and kept close to the roots.

Before it is taken up, let there be a mark made upon its bark with chalk, facing the south; and let care be taken in the setting it in its new place, that this mark faces due south again.

The sap naturally rises most in trees on that side which is next the sun; and if the same side be not kept next in the removal, this alone will make a confusion, and be a check upon the growth; which is the great thing to be avoided in transplantation.

The best season for this work is in the latter end of October. The watering of new planted trees, is necessary to all, but it is the more needful as they are larger; and they will then bear it also in greater quantity; too much
water

water in a cold season to a very young tree sometimes chills it.

Care must be taken in these cases, to spread those roots evenly which stand out beyond the clump of mould taken up with the tree; and to close the earth well about them.

When the tree is thus planted upright and steady, it must be staked up to keep it so. One or more stakes are to be thrust firmly into the ground for this purpose, and the tree is to be fasten'd to them with a hay-band; and it is always good to put a handful of moss between the stakes and the tree, that they may not rub and injure the bark.

If it be planted where cattle may damage it, it must be secur'd by bushes of black thorn, or by a hedge; or paling round it: for they will prevent many a tree from growing, by rubbing themselves frequently against it; beside their injuring it by cropping.

Farther, to secure the success of the plantation, lay a quantity of fresh cut fern, or pea or bean stalks, all about the roots. This keeps the earth moist about them, and by degrees the plants rot and decay, and the earth receives their substance, which is wash'd in by rains as a manure, greatly improving the soil, and promoting the growth of the tree, just when there is the fear of its being check'd by the removal.

If the place or season render it inconvenient, to get any of these things to lay about the root, it is adviseable to lay a good quantity of large stones there. These answer the same purpose in keeping the ground moist; and they also press it down steady and firm to the roots.

C H A P. IX.

Of transplanting trees at a large growth, or at improper seasons.

THERE may sometimes be occasion to remove trees of very large growth, or at an improper season of the year: we shall therefore add here the best methods for doing either.

When a very large tree is intended, a year before the time let the earth be open'd at some moderate distance in form of a trench; so as to leave a ball about the stump, of five, six, or more feet in diameter, according to the bigness of the tree. When this is dug to the needful depth all round, and the side roots at that depth are cut through, let a

rope be applied to the upper part of the tree, and by the strength of three or four men, let it be pulled on one side till the workman can get at the strait downright root or tap root. Then let him cut through that root with an axe, and when this is done, let the tree be set up strait again. When it is up, let the earth that was dug out of the trench be thrown in, and then tying two more ropes round the upper part of it, drive three stakes at some distance in the ground, and fastening the other ends of these ropes to the stakes, the tree will be able to stand against the wind, which otherwise would blow it down. In this manner let it stand till that time next year; or if it be allowed to stand two years, the better.

The season for removing it, is just after a good frost. Let the hole in which it is to be set be got ready; and the earth about the root well wetted before the frost, that it may bind together in a firm lump about the root: in this condition let it be removed and set in the hole where it must be secured by ropes and stakes as before directed.

When trees are to be transplanted in summer, the great art is in preparing the earth for their reception. They must be taken up with the cautions already given, and the mould should be wetted to make it hold together about them. Then in the hole where they are to be planted, there must be put a large quantity of fine mould mix'd with cow dung, and beaten up with a sufficient quantity of water to reduce it to a paste.

When the hole is thus prepared, the principal branches of the tree must be shorten'd; and it must be removed with a good deal of earth about the root; it must be set upright in this paste, and more fine mould must be thrown in and pressed down upon it: then the hole being filled up, is to be cover'd with turf; and a quantity of stones should be laid all about the bottom of the trunk to keep it moist, and to preserve the tree steady.

In this manner, trees may be transplanted when of ever so large a size; or at ever so improper a season. But these are occasions which seldom offer in the husbandman's way, pleasure demanding them much oftener than advantage. We have given the rules, that nothing might be omitted; and having thus treated at large of raising and transplanting trees in general, we shall advance to a full consideration of each kind.

BOOK II. PART III.

Of the several kinds of timber trees.

CHAP. X.

Of the oak.

WE have spoken of the oak among other timber trees, in delivering what in general concerns their raising; but we are here to consider it in particular. We shall avoid repetitions of what has been said in that general discourse; reserving to each head what is, in some degree, peculiar to that tree.

The oak is a large tree with a rough bark, spreading branches, and large leaves, deeply wav'd at the edges: the flowers are inconsiderable, they are a kind of brown threads: the fruit is the acorn, standing in a cup, and growing in some trees on a longer, and in others on a shorter foot stalk. From this difference some have distinguished two kinds of oak. Others have, in the same manner, divided it into two kinds, one of which rises more in height; and the other, which they call the wild oak, spreads more into branches. But these are accidental varieties, not distinct kinds.

The oak will grow in almost any soil: for we find oaks on all kinds of land. On clayey, sandy, and stony ground: but in clayey soils it obtains most firmness. The best earth for oak, is a rich loam. This is a sound and commonly a deep soil. Too much wet is an enemy to this tree; and 'tis principally for this reason it grows best on somewhat rising grounds, for they are naturally more dry than the absolute flats on which wet lodges.

When the ground is too moist the oak puts out moist branches, and the trunk is defrauded of its due nourishment; and in very dry and exposed places it grows low and stubbed.

The timber in moist ground is softer, and in these hilly and barren places it is harder than its usual quality, but 'tis of an uneven grain, and less useful.

The finest oak timber is that which has grown on a firm good soil, inclining to clay, and where there is not too much moisture.

It is propagated three ways; from the acorn; by raising

in a nursery, and then transplanting; or by taking up young sets out of the woods, where they have risen wild.

Of these methods we altogether prefer that of raising the oak from the acorn, in the place where it is to grow. Oaks from the nursery are commonly twice transplanted to come to their standing place: this gives them two checks greater or less; and disposes them twice to an unevenness in the growth: as to the sets taken out of woods, they are the worst of all. Idleness or frugality may tempt those who will not raise, or purchase them out of a nursery to do this, but these having been rais'd under too much shade, are usually ill shaped; and as they are planted out into more exposed places, they commonly get a bad growth,

CHAP. XI.

Of raising oaks by transplantation.

IF any one notwithstanding these disadvantages will plant the wild sets, the method he is to take is to cut them off close to the ground, with a sharp knife, and by a slanting stroke, as soon as they are planted. This gives the root time to recover some strength, and as it affords a new shoot, that is often better than the original plant. But it would be better this shoot rose from the root than from a stump.

Those who raise oaks in a nursery for transplantation, must observe a different method from what is to be followed by such as sow them where they are to stand. Let the acorns be shook, as soon as fully ripe, from a stout branch of a well growing oak; and immediately planted in the nursery.

They are to be set in lines, at two inches asunder, and about two inches and an half deep in the ground. They will shoot the succeeding spring, and they should be suffer'd to stand till that time twelvemonth: then they are to be transplanted into another part of the nursery, and set at eighteen inches distance, in rows three foot asunder. They are to be watered a little when first transplanted, but this must be carefully done, for too much wet is apt to hurt them.

The oak is a particular tree, and requires, as well as deserves, a particular care in its management. In many little respects the conduct is to be different from that observed in the raising the generality of trees; and it is to a want of regard

regard to these, that so many young oaks are lost more than of other trees.

The young trees thus transplanted are to be watered sometimes in dry seasons, and kept clear from weeds. It is also good to dig between the rows : for this, by breaking the soil, affords a greater supply of nourishment, and at the same time cuts off the stragling or far-spreading roots, which will make the young trees bear their next transplantation the better.

While they stand in these beds they are to be regulated in their growth, but in this only a little is to be done. Those who cut off the head destroy the tree, for if there be not a leading shoot, the whole will perish. Neither are many of the side branches to be taken off, but only such as tend to too much spreading. The trunk of the oak is to be the great benefit ; he must therefore cut off such branches, as would draw the sap away from it and starve it : but it is prudent to leave a competent number of the others, to draw up the sap. When a young oak is too close pruned, the head always grows over proportioned, weighs down the tree and spoils its future progress.

When the trees have thus stood about four years ; that is, when they are between five and six years old from the sowing, they may be conveniently transplanted. It is dangerous to move them in the common way, when they are older, for the oak bears removing, when grown to any size, worse than any other tree.

The time for transplanting them is just before they begin to shoot ; and it is prudent to chuse a showery season : if no rain fall they must be gently watered, and staked up to keep them straight.

This is the method for raising oaks by transplantation ; and when they are wanted for beauty and ornament, as for clumps in parks ; and for wildernesses in large gardens, it is a very good method, because they may be had of a proper growth from the common nurseries : or from the owner's own stock, raised there for other purposes. But when oaks are intended for timber ; and use and value are more studied than ornament ; 'tis the best method to raise them from the acorn, in the places where they are to continue.

C H A P. XII.

Of raising oaks from the acorn.

THE directions which have been given for raising trees in general from the seeds, might seem here, and on the like occasions hereafter, the repetition of a great many needless words ; but in each we shall deliver whatsoever there is required particular for the raising of that kind.

When the oak is to be rais'd immediately from the acorn, a different method, and different seasons are to be observed for sowing.

Let the acorns be gathered when full ripe, from a thriving tree, and immediately spread upon the floor of a dry shady room. When they have lain a week, frequently turning them, let them be put up in large garden pots, with a quantity of dry sand, and laid by for the winter.

Early in spring let the ground be marked out where the plantation is to be made, and at the distance of forty foot every way, let the holes be open'd for receiving them. These are to be dug two spit deep, and the earth well broken, four or five acorns are to be put into each, and cover'd two inches deep, and when they have shot, and acquir'd a little growth, all the plants, except the one best in each hole, are to be taken up ; and that single plant is to be nursed for some years with care.

The head of these young trees should be suffered to grow, and none of the branches should be cut away, except such as spread out too wide, as in the nursery ; and if it happen that in spite of the care in the choice of those plants which have been suffer'd to stand, any one be uneven ; the best method is to cut it off at the ground, and wait for a new and better shoot.

A plantation of oak thus made, if the soil be tolerable, is a fortune for the successor in the estate ; but it is not limited to that : men enter too late upon these studies, otherwise they might reap the benefit of their plantations themselves. If any one would begin to plant at eight and twenty, and should live to see sixty-three, there is a space of five and thirty years, which is a time for raising even an oak plantation, to very considerable value, though not to its full price.

It is not easy to give what can be call'd a middle calculation for the growth of the oak, it differs so prodigiously in respect

respect of the soil, situation, and other circumstances. But oaks are now to be seen in this neighbourhood, which were planted thirty-four years ago in the acorn: and the least tree among them is fourteen inches diameter in the trunk.

An oak of this bigness is but advancing toward the proper time of felling, and towards its value; but if the necessities of the owner induced him to fell these at this time, the price of the worst tree among them would pay for the labour and charge of the whole plantation.

If the young plants, when they rise in these spots, appear almost above the ground, or stand too high with their roots, the best method is to lay up a parcel of fine earth against the bottom of that which is the most thriving shoot. This happens sometimes from the acorns being not set deep enough; and sometimes from the weather: for after a frost the mould will rise, and bear up the young shoot with it.

Acorns are not to be buried too deep, especially in a moist soil, for they often rot. On the other hand, they must not be set too shallow; for it not only makes the shoot stand too high, but frequently the field mice find them out, and devour the hopes of the plantation.

The quantity of ground taken up by this plantation, at forty foot distance, is not to be supposed wasted: for tho' the oaks will, in their larger growth, require that distance, they do not at first. For many years ashes may be rais'd upon the ground between the oaks, for poles, and cut to a great advantage. Underwood of all the shrubby or coppice kinds, may also be planted for a time, if the ground be fit for it: or it may be graz'd, and will lose little of its value for several years. Nay the planting the trees at this distance is the only way to preserve a value in the ground for such purposes; and when the soil is good, it will continue to yield fine pasture.

For an instance of this I need not send the reader farther than to that elegant and noble plantation Bushy-Park: where, all about the cascade, he will see oaks of a very noble growth, at about forty foot distance, more or less, and the whole surface of the ground about them as green as the finest meadow.

C H A P. XIII.

Of the uses of the oak.

NO plantation exceeds that of oak, when made in this manner, in beauty : and to those who will suffer it to stand a proper time, none equals it in value. The trees will rise with a single strait and upright stem, and their branches spreading every way with a beautiful regularity, make, when clothed with their large and fair leaves, a fine appearance. Their shade is preferable to that of any tree whatsoever : their very imperfections and excrescencies, the oak apples, oak cones, and oak grapes are beautiful ; and the air is perfumed and rendered healthy by blowing over them.

Among the excrescences of the oak I have not followed the common custom of ranking the mistletoe ; because it is not an excrescence, but a regular plant, rising from its own seeds ; though its place of growth is not the ground, but the bark of some tree ; and no trees afford it so seldom as the oak.

The acorns, which a good and well-grown oak bears annually in vast abundance, are an excellent food for hogs. No fruit feeds them so well, it gives their flesh also excellent taste. The flavour of the Westphalia hams is owing to this food. They are made from wild swine that live in the forests ; and it would, doubtless, be an improvement of our hogs flesh intended for that service, if the creature were fed with acorns.

That they give a flavour to the flesh of such swine as eat them in abundance, is not to be questioned ; for our country people, who are not accustomed to that taste, always feed their hogs some time with pease after acorns, to take off the flavour.

This effect of food on creatures in giving a taste to their flesh, is not to be doubted. The heath-cock of Germany is not eatable in autumn, except by the peasants, because its flesh tastes so strongly of the juniper berries which he eats at that season ; and as to the effect of particular food on hogs, an instance is given in the philosophical transactions, of the very bones of a pig being ting'd red, by its eating madder root at a dyer's.

The hog eats acorns most freely and naturally, and is best fed with them ; but what nature has meant as food to one
I
animal,

animal, may, by proper management, or in necessity, be made food to others : poultry will eat acorns if broke small, and given them among other food, and nothing fattens them more. They have also been given to oxen, among their dry food ; and we read that before the cultivation of land was so well known, they were, in part, the food of mankind.

Their effect in fattening the hog is supported by sufficient experience. A peck of acorns a day, with a little bran, will make an healthy hog encrease a pound each day in his weight, for fifty or sixty days together.

The bark of the oak serves the tanner, and fetches a large price ; the dyers also use it : and it has been discovered some years since, that the young branches of the oak cut and ground to pieces in a mill, answer the same purposes, and that in as great perfection.

We mentioned saw dust among manures ; and experience shews none is so excellent for that purpose as the dust of the oak : this is natural enough, because this is the most firm and solid of all our timber. Those who have try'd say also, that of the kinds of wood ashes used in dressing of land, the oak claims greatly the preference.

These are but, as it were, accidental articles of value in the oak, its great worth is in the timber, which in solidity, strength, and soundness, exceeds all our other kinds, and is therefore of all the most fit for great and lasting uses. Of all kinds of wood yet known in this part of the globe, the oak is in its service the most universal.

Beside its prodigious use in our shipping, it is called for, on many occasions, in buildings, and for instruments. It resists the injuries of weather more than any other wood, which is not a wonder, for even the fire takes effect upon it much slower than on any other ; and some of it is so hard that the best tools will scarce work upon it.

In water-works, where the timber is exposed both to the air and the water, none stands like the oak : and no wood is equal to it in the support of burthens. The ebony and some other foreign woods, when they are very hard and firm, cut as difficultly as oak, but if they are try'd in the supporting of weights, they start and fly under half the pressure, that a piece of oak of the same size will support with perfect safety.

Even the defects of oak, give it strength for certain particular purposes. It is not unusual for an oak trunk to grow

grow a little twisted : this may be discovered through the bark as it is standing, but is very visible when the tree is fell'd and strip'd : the trunk of such an oak is useful beyond any other, for the supporting vast weights. Where posts are required for such a purpose, nothing equals it.

In buildings the straightest, finest, and evenest growing pieces of oak are usually wanted, and they bring their price accordingly ; but for engines where a vast strength is required, the body of one of those stubbed, and rough grain'd trees, which are not fit for other purposes, and which are so hard that a tool will scarce pierce them, is superior to any thing.

There is no oak, while sound, that is not fitted for some purpose. Those parts which will not do for greater uses makes pales, posts, coopers ware, and laths ; all which bring their price : even the least pieces are worked into the pins and pegs us'd in tiling, and that way are of value.

Oaks that grow crooked, and are firm withal, make what they call knee timber for shipping : the knottiest and roughest pieces are fit for piles in water works ; and mill wheels, and spokes for other wheels are made from the proper pieces.

Beside all the uses of the oak in its various conditions, consider'd as a timber tree ; we are yet to consider it as a part of the coppice wood plantation ; and no kind is there more valuable. The oak maintains its character in every condition.

When it is sown among the coppice wood, to be fell'd with it at twelve or fourteen years growth, it yields excellent poles for hoops. 'Tis usual to make these of ash, and some take hazel ; but the preference is due to the oak hoop beyond all degree of comparison : the ash does not exceed the hazel for hoops half so much as the oak exceeds the ash. An oak hoop will last out seven of any other timber.

The smallest poles serve as staves, and the least make walking sticks. The root of the oak where it is knotty and firm, has great beauty, and is used by the turner or inlayer.

Thus we see this universally useful tree supplies us with materials of numerous kinds ; timber, from the ribs of a man of war to a walking staff, and from the main beam of a house to the pegs in the tiling : not the least particle of it but is useful. Even such as is fit for nothing else in the coppice oak is excellent for firing, whether split into billets from

from the larger pieces, or cut into faggots it excels other wood. The charcoal that is made of the oak is also better than any other.

C H A P. XIV.

Of the growth of oak trees.

THE growth of the oak is different on various soils; and has been found to vary exceedingly at different periods on the same place. An oak has been observ'd to grow very freely for twenty successive years: at the end of this time it has come to a stop, and has for ten or a dozen years made little progress: from this time it has begun to grow again, and has continued in its usual way increasing visibly in height and thickness.

This, though seeming to arise from some hidden cause in the tree, is really owing to the soil. The oak being planted in a good earth, spreads out its roots, and flourishes so long as they remain within the compass of that coat or layer of the ground; but when they have pierced through that, and got into some other starving and poor earth, they receive little nourishment, and the tree comes to a stand. It would continue so all along afterwards, were it not that the same roots pushing deeper and farther, find good soil again. Thus in the present instance, the rich soil holds the roots twenty years, and affording sufficient nourishment, the tree all that while grows freely. At the end of that time they penetrate into some unfavourable layer; there they are kept twelve years, all which time the tree hardly grows at all: till at the end of this period the roots piercing into another bed of good matter, supply the tree as at first, and it then grows and increases again as it did from the beginning.

It has been observed already, that the oak will grow in any soil, though it thrive differently according to the nature of that earth: but the difference that is made by soils in the speedyness or slowness of the oak is not all: for the very grain of the wood is affected by it.

On barren heaths, where the bottom is stony, the oak is ill-grain'd and coarse: the grain of such as has been rais'd in sandy soils, is smoother and evenner than any: but that which has been fed by a good firm loam, inclining to clayey, is the right substantial and true grain'd timber.

In the forest of Dean in Gloucestershire, there have been long since iron works, and a great deal of the ground is co-

ver'd with slags of those old meltings. These are taken up and wrought at present by the people who work the fresh ore also, and that to a great advantage. From thence has risen an opinion, that these slags were filled with a fresh quantity of iron from the air. But this is an error. The truth is, the old work-men did not so well know how to get all the metal out of the ore, as our people do at present; or that having great choice and plenty, they did not trouble themselves to work near: however that be, 'tis certain that all the iron now found in these slags was left in them at that time. The occasion of naming them here is, that from these masses of slags, oaks grow in abundance in that forest, and to a great value. A great part of their roots are spread among those slags, some piercing down below them, and others running through them to a better ground that lies at a distance; for the roots of trees spread farther than is imagin'd. In Hampshire, and other places, oaks grow out of stone walls, and rise to a great height, and to the containing very considerable quantities of timber.

Tho' the oak will grow any where, we see how it may be stop'd in its growth by a bed of unfavourable matter. These things are not set down for curiosity, or to raise mens wonder, but for use. As the planter sees an oak may be thus stop'd for a course of time, so that it shall be as good at twenty as at two and thirty years growth, it will be worth his while to take all precautions to prevent such an accident. We have directed the use of an auger for boring the ground in search of marle, it will be adviseable that the same instrument be used in examining the earth, where an oak plantation is design'd. That the planter may know to what a vast size and value oaks will grow when the soil favours them, not only in condition, but depth, we shall give him an account of what bigness some have reached in England, as supported by unquestionable authority.

In Worktop park the duke of Norfolk had an oak which spread almost three thousand square yards. Near a thousand horse might stand under the shade of it: this is affirm'd upon good authority; and it will appear the more credible from other instances of the vast size of some of those trees. Dr. Plot in his Oxfordshire, tells us of an oak at Clifton, that spread eighty one foot from bough end to bough end, and shaded five hundred and sixty square yards of ground. It was computed five and twenty hundred men might stand sheltered under it. The famous Robur Britannicum in lord Norrey's

Norrey's park at Ricot, was computed to be able to shelter between four and five thousand men.

The mainmast of the old Royal Sovereign was ninety nine foot long, and near a yard thick, all of one piece of oak; and some of the beams of that ship were made from another oak near five foot thick, and were forty foot in length.

What must be the value of these trees is very evident; and there is no reason why any man who will take the pains of raising his oaks from the acorn upon the spot with due care, and will see that the soil be perfectly fit for the growth, may not leave an inheritance of such to his posterity.

The oak requires less lopping than any other tree, whether it be intended for beauty, or for use. Nature rarely over-proportions the branches to the trunk; and they spread with great regularity and grow in value with it. If there be any danger of a branch growing to an immoderate extent, so as to rob the trunk of its nourishment, that is seen in the first years; and directions have been given already for the retrenching such: for the rest, the oak does best when left to nature; according to the most accurate accounts, the common opinion as to the time of its growth, duration and decay, speaking in round numbers, is not far from truth. Oaks have been known to continue in a state of growth and increase ninety or a hundred years; and we have records of the planting some in some old parks, that are of near three hundred years standing, and now are in a state of decay.

'Tis idle to suppose the exact period is determined by these numbers, but probably a tree that attains its full maturity so slowly, remains a long time sound, and is long also in decaying; and this the firmness of the oak wood makes it the more natural to imagine.

C H A P. XV.

Of the felling of the oak.

AS an oak continues growing near a hundred years, 'tis best not to fell that tree till after the full period of the growth, when it can conveniently be suffer'd to stand so long: but with a view of advantage, it is idle to think of its standing any longer: for it can never be better than when at full maturity.

This is, therefore, in general, the best time of felling, but no particular period can be limited for each tree; for of

those raised from acorns of the same bough, and sown in the same soil, some will thrive better than others.

When a quantity of timber is to be felled, let the workmen begin with the decay'd trees, if there be any, leaving the best and most flourishing till the last, because they can get no damage in standing a little longer; and the others will be perishing every day more.

More things enter into the consideration of felling the oak than any other timber; as the separating of the bark for the tanners, and the like. The best season is the latter end of April.

The trees being mark'd out that are to be felled, the first thing is to cut off such arms as may damage the trunk in the fall. The manner of doing this is, by beginning below close to the trunk: when they have thus cut the arm about a sixth part thro', they are to begin at the top near the trunk also, and when they thus come near meeting the other cutting, the arm falls off without splitting.

When the branches that may be hurtful in the falling are removed, they are to go to work upon the trunk, cutting it down as near as possible to the ground, because the length of the timber is a great article in its value, beside the adding to the quantity.

When the oak is down, its trunk is to be strip'd of the bark, which will come off freely at this season: as the bark is taken off, set it up in such a manner as it may dry best. After this take off the bark from the branches; and set it up in like manner: when this is done, let the branches be taken off; and then cut it into lengths for sale.

In some places they take off the barks of oak trees as they are standing, a year or more before they are felled. This is done to give a strength and firmness to the timber, and is called in those places a seasoning of it: but notwithstanding what has been said in favour of this practice, I have never been able to find that it is of any real use.

C H A P. XVI.

Of the seasoning oak, and judging of the timber.

THE wood being cut out, the next care is the seasoning it: this is done several ways; but all of them require time. Green oak is fit for few purposes; and a great deal of its value in many cases depends upon the seasoning.

The plainest and most familiar method is to trust to time
only,

only, taking care to prevent accidents. Let the timber be laid up till dry in a careful manner. Let it be taken off the ground at a dry time, and laid up in an airy place, but out of the reach of the sun, and defended from the winds, both which crack it in drying. Let blocks be put between the several pieces, to give passage to the air. If this be omitted, they grow moist and mouldy, or breed toadstools. Time will thus take a proper effect, the timber will shrink gradually and regularly, and being thus season'd, it will stand when it is employ'd in building, or on other occasions.

Another way of seasoning oak timber is by burying it for some time under ground: but this must be done in a dry soil.

The best method for many purposes, and particularly those which require the best season'd timber, is that we learn'd of the Venetians, which is called the water seasoning. It is done by sinking the timber under water; and no way is so good to prevent its splitting. The Venetians keep the timber for their sea service two or three years under water before they use it.

The water seasoning is done in this manner. When the oak is cut into boards, or pieces, they sink it under river water for fourteen or fifteen days. Then they take it out, and lay it up carefully to dry in a cool airy place, as directed in piling up the fresh timber; preserving it from winds and sun, but leaving the air free passage amongst it.

Oak that is cleft is not so apt to split as such as is entire: and round pieces are always more ready to crack than such as are squared. These are standing rules, and the workman is to conduct himself in his choice accordingly: pieces that are bored through seldom split. In general the more the oak is in its natural condition, the more liable it is to crack; and the more it has been cut and wrought, the less.

Burning the ends of posts of oak that are to be let into the ground, has been accounted an excellent method to preserve them a long time; and some have carried this practice so far, as to burn the ends so deep as to impair their strength. It is at present much disputed, whether this practice be of any use at all. If not, 'tis a great deal of trouble thrown away.

Burning naturally preserves that part of the post from the worms by which it is subject to be gnaw'd under ground; and the Dutch to prevent the same accident under water, cover over their piles and ship bottoms with pitch and tar; on which they sprinkle sea sand with powder of sea shells among

it, and flakes of iron, such as fly off in the hammering.

In the choice of oak timber, the purchaser should examine the weight and the grain: the heaviest is always the best for purposes that require great strength and soundness, and the smoother and evenner the grain, the better it is for most occasions. Oak is not to be trusted in any nice works, till it has been thoroughly season'd: and that from full grown trees, is preferable to such as has been cut from smaller. When the tree has stood beyond its time, the wood becomes somewhat brittle; this is the first tendency in oak to decay.

C H A P. XVII.

Of judging of oak as it stands.

THIS is an article of great consequence frequently, and nothing is so difficult: and it is common to purchase trees standing; and in oak 'tis of great importance to be able to guess at their value. Where all is good, nothing would be so easy, for the question might be answer'd by measuring; but nothing is so capable of deceiving as a tree while it stands. There may be many infirmities which 'tis impossible to discover; and which greatly lessen the value. Such as may be discover'd we shall point out; as also the signs of decay.

If the head be in any part dead, 'tis a sign there are more faults in the body: in this case it is a good method to bore into the trunk with a small piercer made auger fashion, and observe the condition of what it draws out.

If in any tree there be a swelling vein perceiv'd rising above the level of the rest, and cover'd by the bark, it is a sign all is not well within. When this vein twists about in the manner of a stalk of ivy, it is worst of all: this seldom is seen but where the heart of the trunk is rotten.

Another good method of judging is, to open the earth about the roots; and examine in what condition they appear. If they be fresh, sound, and full of juice, it is a sign all is well above: but when many of them are decay'd without any visible cause of the ground; and when some are rotten, brittle and mouldy, all is wrong in the body of the tree. This is a part not so much attended to, but a decay here is a more fatal sign than the deadness of the head.

A great deal is to be judged by the general aspect, and that much more by those who are accustomed to these things than strangers. There is a look of health in a tree that is perfectly

perfectly well and sound, which no other perfectly has. And though people who should be judges are often deceived, it is their want of observation, or their want of knowledge that often leads them to it. There will sometimes be faults which no person whatsoever can discover till they are seen in cutting thro' the tree; but the greater part of those which debase the value, are not of this kind: they may be guess'd at least, if not certainly known, from some one or other of these marks on a careful inspection.

C H A P. XVIII.

Of the elm; its kinds, and proper soil and situation.

NEXT to the oak the elm is the most universal of the English timber trees. It is the most common in hedge rows; and is thence the most familiar to the eye of all the kinds.

The elm is not a tree remarkable either for flowers or fruit. Both are inconsiderable. The first is scarce at all regarded; and the other rarely minded, unless when fallen in heaps under the tree. The flower is little and hollow, with some threads in the middle; and the fruit is a flat leafy case, having in the middle a longish seed vessel, somewhat like a pear in shape, with one seed.

We have five kinds of elm commonly in our plantations. Some in hedge rows, others in coppices; and some in avenues. It is of great importance to the planter, to have a perfect knowledge of these distinctions; and to chuse the proper kinds according to his several occasions. One being preferable on some, and others on the others.

The five kinds of elms are these. 1. The common elm. This is a tall, well growing tree, with broad rough leaves. 2. The narrow leav'd elm; this has small and narrow leaves, and is called by some by way of distinction, the English elm. 3. The Dutch elm; this has broader leaves than the common elm, and as rough as they. 4. The witch elm; this has very smooth and broad leaves: and, fifthly, the broadest leav'd kind of all, which is called the witch hazel.

All these succeed in our plantations, but it does not appear from the earliest accounts that any one of them are natives of the kingdom. Some are taken into gardens for hedges; and the nursery men who spoil many a handsome tree for curiosity, have found the way to raise them with yel-

low and white, variegated, or as they call them, *strip'd* leaves.

The common elm, the narrow leav'd, and Dutch elm, are best for ordinary plantations; the two others, the witch elm, and witch hazel, do best in woods. These grow very well among other trees; but the other kinds, though they succeed elsewhere, and will bear to be planted in rows very near one another, do not thrive in woods.

This is a singular observation, but it is not difficult to be explain'd. The elm, when intended for long growth, must have free air, and a large scope for its roots, where there is plenty of nourishment. For this reason several elms standing very close to one another thrive, because they are yet open to the free passage of the air from each side, which they are not when choaked up every way in woods: and their roots here can spread to a distance under the turf, and find nourishment in abundance, which they cannot in woods, where every inch of the ground is full of roots of other trees.

The elm is hardy, and full of life: but it requires a great deal of nourishment; scarce any tree more. It will send out its roots a vast way to search it, but then it must be furnished in plenty in those places. Thus it is supplied where other trees are not planted about it, but not where they are. This is the sole reason why the elm succeeds in hedge rows and avenues, but not among the other trees of a wood. Far from hurting one another by being planted close in hedges, they thrive the better: for they defend one another from winds, and are observ'd to grow straiter and taller in these places, than when they stand single.

Though the elm will grow any where, yet it requires a good soil and situation to thrive. When too much expos'd, as upon hilly lands, it does not prosper nearly as in lower grounds, neither will it succeed well in a hot dry soil. It will live in sandy or gravelly grounds, but he knows little of his interest who plants it there. In some places the elm has been observ'd to grow very poorly, though the soil was good, but there has been a bad bottom.

The soil the elm loves, and in which it prospers to the utmost, is good rich mould; and the situation that most favours it, is a level and somewhat low ground, for it loves moisture. In the hedge rows of such lands elms yield a vast advantage. They will often grow very well under the advantage of that situation, even where the soil is not such as best suits with them. The husbandman may know by the growth

growth of his neighbours elms, whether they be a proper plantation for his own grounds; for where they grow tall and strait, they also grow quick; and, on the contrary, where they are low, stubbed, and ill-shap'd, they grow slow: this is his great consideration. For in one place he will have good timber in a little time, and in the other, he will, after a great while, have much less in quantity, and that from its ill growth also, of less value.

Let him plant elms only in favourable soils, and good situations; in places not expos'd, in light earth, and where there is moisture. There are trees enough for his hilly places, and dry soils, as will be seen hereafter; and in such the elm will never thrive as in others.

Let him prefer the English elm, either of the broad or narrow leav'd kind to the Dutch. In this I shall seem particular, contradicting the vulgar practice. It is supposed the Dutch elm thrives quicker, but this is an error. For the ten or twelve first years the Dutch elm will out-grow the English, but that is all. I have seen two planted together of equal size, and equally thriving trees: for ten or twelve years the Dutch has out-grown the English; but after that it grows more slowly, and, on the contrary, the English more quick: by eighteen years old the English elm had greatly the better of the Dutch; and at this time 1748, both being of three and twenty years growth, the English exceeds the other by a vast deal.

The planter may hence take this lesson, if at any time he have a mind to cut the elm while small, the Dutch is best, but this is not the common design: when rais'd for timber, the English has the preference: and the timber of the English elm is also much better.

If any one is determined to have the larger elm in coppices, though the witch elm and witch hazel are fittest for that use, he must plant them only at the edges of the piece, and for this purpose the Dutch elm is better than the English, because in twelve or fourteen years, the common time of growth of a coppice plantation, it will be larger than an English one.

The English elms are altogether to be prefer'd for timber trees, and of the two kinds of these the careful planter is to chuse the broad leaved for the richer and moister soils, and the narrow leaved kind for the dryer and poorer. If he will plant elms in his hilly hedge rows, the narrow leav'd sort will grow better than the other. For parks and avenues

nues the broad leav'd elm is to be prefer'd, because it is the more beautiful, and the more regularly growing tree.

CHAP. XIX.

Of the propagation of the elm.

THE elm may be rais'd any way that any other tree whatsoever can. It will grow from fresh poles stuck into the earth, in the manner of the willow; and may be rais'd in great abundance, by burying a large piece of a fresh branch in the ground.

It may be rais'd in the nursery either from seed or by suckers, and it bears transplanting perfectly well.

If the planter use a nursery let it be on a piece of even ground well fenc'd; and order'd as before directed. Many say the elm bears no seed, and some have written so; but that is a strange error. Whoever walks in an avenue of well-grown and thriving elms in April, will find the ground cover'd with the seeds, in those thin leafy cases we have described. To get the seed let him mark out a well-growing tree, and watch the falling of these parts. Let a quantity of them be gathered, and directly sown in the nursery in rows, at a small distance and very shallow, the earth being only just raked over them.

They will shoot in great abundance; and are after a little time to be thinn'd: the ground is then to be kept clear from weeds; and at two years growth they are to be removed into another bed, planting them at two foot distance, in rows four foot asunder: and here they are to be kept till they are of six or eight years growth, at which time they will be fit to transplant.

The nursery must be, all this time, kept clear from weeds, and the ground dug every spring between the rows; and from time to time they are to be prun'd up, cutting off large straggling branches, that would hinder their upright growth; in which both the beauty and value of an elm consist. The elm is, while young, to be prun'd much closer than the oak; but even this is not to be wholly deprived of its shoots; for a naked trunk, with only a twig at the head, will never rise to be a fine tree. Some small shoots must be left on, otherwise the sap all runs up, none staying to encrease the trunk, and the small top is too heavy for the support of its weak stem: this bows down therefore, and the tree will grow for ever crooked.

The

The common way of raising the elm is from sets, which grow in vast abundance from the roots of the old trees in hedge rows, where the soil is favourable. Poor people take these up, and sell them to the nursery-men, who thence raise young elms for sale. The best time of removing these suckers is toward the end of October; but the trees thus rais'd are seldom so good. The way from seed is very easy; and the plants sown in spring will be up by the beginning of August, and will stand the winter of themselves, though if a little loose straw, or other such matter, be scattered over them by way of defence, they will succeed the better.

Those who would raise elms from stakes should cut them about six foot long, and of the thickness of a child's wrist, striking them off at the bottom by one slanting stroke. These being stuck down in a moist and mellow earth in spring, will shoot vigorously, but irregularly. This is to be done early in the season, and in a rich and somewhat damp soil.

Those who raise elms by burying the branches, or large boughs, or the trunk of some small tree, must chuse a good earth, where there is some moisture, and it must be done in the spring season. In this earth they are to dig trenches of a foot deep, and to lay in them a piece of six, eight, or ten foot long, of a large bough, or of the small trunk of an elm. They are to cover this up with the earth taken out of the trench, and watering it once or twice leave it to nature. There will rise many young shoots in a few months, from every part of the buried wood. But these are methods to be used only to suit particular purposes.

Those who would spare the trouble of sowing the elm, by taking up wild suckers, had better do it themselves, than purchase them of others; and they had better prepare for the getting them that take them as they happen to rise.

The way to prepare for them is this. Lay bare some of the large roots of a tall and thriving elm, and chop them with an axe one fourth part through in several places. Put a little piece of wood, or a small stone, into every nick, and cover the roots up with mould about three inches. There will rise from each of these nicks a number of suckers, which at two or three years growth may be taken off and transplanted.

Another way of obtaining suckers in plenty is this. Dig a strait trench at some distance from an elm. The roots
I having

having been wounded by this, and being laid bare will send up a vast quantity of suckers. These are to be cut off from the old roots, and transplanted at two years growth, and they seldom fail to produce good trees.

We have mentioned these methods, to shew how easy it is to raise a supply : but there remains yet the other way, by layers ; for, to go regularly to work, the way is to raise the young elms either from seed or this way : they are by one or other of these methods, more certain of growth when transplanted, and of being strait and well-bodied than by any other. The method is this.

Let a small piece of ground be dress'd carefully for receiving the roots and stumps of some elms, which are to furnish shoots for layers : these roots, with their stumps, are called stools.

The soil should be light, with some degree of moisture ; and it should be trench'd, and a little well rotted dung buried in it. The plants must be let into it at about eight foot distance. The season for this is autumn, and being a little watered, and the ground dug now and then about them, they will, the next spring, make a great many vigorous shoots.

These shoots are to be laid, when they are of two years growth, in the middle of February, in this manner. Each shoot is to be slit a little way, and then buried under the mould. Five or six inches depth of earth is to be laid over the shoot ; and its top is to rise a foot out of the ground.

When all the shoots are laid the stool is to be well watered : and this is to be repeated when it shall appear necessary. By this means, these shoots will all have taken root by the following autumn, at which time, when the leaves are fallen, they are to be taken off and planted in the nursery, at a foot and half distance, in rows three foot asunder. There they may stand till they are of a size to remove into the proper places.

This is the practice, call'd by the gardeners and nurserymen, laying ; and it is idle for any one who intends to plant many elms, not to do it for himself : a few stools yield a great number of young elms, with scarce any trouble.

If at any time a shoot will not lie readily, it must be pegg'd down with a wooden hook or two.

Instead of slitting the shoot some twist it ; or a wire is
tied

tied tight round it, and holes are pierc'd through and through with an awl; or the shoot is lightly cut round. Any of these methods will do: for all that is needful is to give the shoot a tendency to push out roots at the place where it is laid: and when that is done, and they have some strength, it is to be cut off from the stool.

Though early in the spring be the best season for laying the elm shoots, it may be done with success in autumn: and although spring is preferable for this and other very vigorous and quick-shooting trees, for others the end of October is better; because they have then the whole winter to prepare for rooting, before they are called on by the warmth of spring to shoot out leaves and branches.

That there is some sap rising all the time from October to the March following, which is the season when the spring shoots are preparing, is plain from this, that there is a continual waste from the live branches of trees at that time: for if they be cut off, and the cut end seal'd up, so that no moisture gets out there, still there will be a large quantity, considering the season, evaporated; and the branches will grow dry and lose their weight. Doubtless the same happens while they are on the tree; and there must be a supply for this from the root.

As there is some sap sent into the shoots at this season, and it does not force out buds or leaves, nothing is more natural than that it should spend itself in sending little roots from the wounded part of the shoot, which is quiet and warm under ground.

This is a substantial reason for laying many trees in autumn; but for such as the elm that thrives so freely, and will send out roots at any time, the spring is early enough. I have named the different seasons, and explained the reason for the sake of the husbandman's general knowledge. Such trees as do not root freely in layers, may be best laid in October; the others in spring.

Having thus delivered, at large, the method of raising a tree by layers, it will be understood when only mentioned on succeeding occasions.

Some have pretended to deny the rise of any sap in winter: and these might well object to the laying trees in autumn; for if no sap rose they would be in the condition of dead sticks at that time, and their buried part would be in danger of rotting. But the contrary evidently appears. It is found by trial that the holm oak, and the cedar

cedar of Lebanon will grow by grafting on the common oak, and on the larch tree. And though the oak drops its leaves in autumn, theholm oak grafted on it keeps green all winter; and the same happens in the other case; for tho' the larch tree drops its leaves in autumn, the cedar being an ever-green like theholm oak, keeps its leaves all the year when grafted on it. It is plain therefore, that some sap arises from the oak, and the larch tree all winter, otherwise these grafts could not keep their leaves; for they could not keep them without sap, and they have no other supply. Less sap satisfies ever-greens, because they evaporate less, but still it is plain there must be some.

The farmer should understand every thing he is advised to practise. And with that design this matter is so fully explain'd to him. He sees some sap rises in all trees in winter: therefore when we shall on any future occasion direct the raising a tree from layers; and order it to be done in October, let him not suppose it an error, or a careless direction: there are many that succeed best that way, tho' the elm does better in spring.

The husbandman has before him the several methods by which the elm may be propagated. But the two which are preferable, are from seed or by layers; and in his choice between these, he is to be determin'd from his particular circumstances and designs. If he intend a plantation to be made at once, and shall not think of repeating that work, the best way is raising them from seed: but if he intend to continue from time to time planting, he is to prefer that by layers. The seedlings are a stock for once; but the stools for laying, will afford a fresh supply every year for his life.

If the farmer at any time want to set a few elms only, it is not needful he should be at the trouble of either of these methods: his best way will be to take up suckers from the hedge rows, chusing the straightest and most promising.

C H A P. XX.

Of the uses of the elm in plantations.

THE elm is a valuable tree, both for the field and garden: and none is more to be esteem'd for plantations, where the eye is to be pleas'd, as well as the estate improved.

No

No tree is so good for avenues and walks, because none grows so upright and regular.

No tree is better for hedge rows, when the soil and situation are proper : for by its regular growth, it is an ornament to an estate ; and its branches not spreading too wide, in the usual way of lopping in hedge rows, it does not shade too much of the crop : and yet it is leafy, and affords a sufficient shelter for cattle.

In parks, the elm makes a beautiful appearance in clumps, or singly : for this purpose 'tis best not to lop it up so close, but to leave some large branches ; or from twenty foot upwards to suffer it to spread as nature pleases. This way elms look very beautiful, but they are apt to grow hollow : the verdure will often keep fresh when the whole heart is gone ; nay, when nothing remains but a shell of bark. This is not wonderful, for the bark conveys up the sap.

The young shoots of the elm are an acceptable food for cattle ; and they may often be cut for this purpose to the great profit of the farmer, when other fodder is expensive.

The loppings are very good for fuel ; and an excellent kind of charcoal is made of the branches.

These are the ordinary uses of the elm in the field, exclusive of its timber. About houses it is valuable because it is very pliant ; and may be made to grow any way.

It is excellent to plant as a defence from winds. For, if left to spread its own way, its growing close, and its great number of branches, afford a good shelter ; but if cut and train'd up, it may be raised into a hedge of forty foot or more in height, and of such a compactness, as to keep off every blast.

Caution must be taken that elms be not for this purpose planted too near the garden, for they will rob the fruit trees of their nourishment, and spoil the beauty of both grass and gravel. No tree spreads its root so wide as the elm, and these will interfere with those of the wall trees ; and as no tree is so apt to send up its suckers from the extremest roots, these will rise every where among the grass, and through the gravel, being an eternal plague to the gardener, and continually defacing the beauty of the walks.

A great advantage of the elm is, that it may be transplanted very large : no tree bears this so well. But let the planter receive this advice, always to get his large trees from a nursery ; because having been there prepared for transplant-

transplanting, they will rise with a good root; whereas those from hedge rows often fail when taken up at any size from the irregularity of the spreading.

It may be proper also here to insert the necessary cautions about removing those trees for the last time, or to the places where they are finally to stand. On this occasion, whether they be very large, or of the common planting size, which is at seven or eight years growth, this must be done in the beginning of October; their heads must be lessen'd, but the leading shoot must not be taken off; nor must the other branches be cut too close. Their roots must not be buried too deep; and especially if the soil be moist. It is better in this case to plant them shallow, and raise a bank or hill about them. When this is done, they are to be staked as directed for the oak, and by these means there will scarce ever a single tree fail.

The season for lopping the elm is about the middle of January; and the oftener this is repeated, the taller the tree will grow. The side boughs are to be cut off freely, but the tops must be spared: when they are cut too near, they frequently let in wet, to the destruction of the tree. In Spain they have plantations of elms many leagues in length, which are kept constantly and frequently lopped, and by their even trunk, great height, and bushy tops, make a very noble appearance.

C H A P. XXI.

Of the value of the elm in timber.

WE have consider'd the elm in several uses while standing, we are now to examine into its value as timber.

The best season for felling it is in the beginning of December. No tree is so vigorous; and therefore the fit time for cutting it down is to be consider'd in a particular manner. To give the greatest value to the timber, the sap must be as much as possible at rest when it is cut: and this is the season when it is in that state.

We have observ'd, that the English elm is better than the Dutch, for the wood is sounder. Of the two common English kinds, the broad leav'd elm affords an even grain'd plank; but the timber of the narrow leav'd kind is harder.

Though these are the only two we usually raise for size,
we

we need not be ty'd down to them, for the witch elm, which we commonly confine to the coppice, will afford an excellent timber : this is not inferior to that of the common elm, and is of the smooth grain'd sort, or more like that of the broad, than the narrow leav'd kind.

The witch elm requires the dampest soil of any ; but in such ground it will out-grow the common. It is this quickness of growth that has given it the preference for a coppice shrub. But it will in such plantations rise to an excellent tree, fully equalling the elm in bigness, and in value.

The planter should consider this, and raise supplies of it, as well as the other kinds. And he should set it always in the dampest places where elms are to stand. He should sow the seeds of each kind ; and dispose them properly, which will vastly increase his profits ; or if he raise them from layers, he should have two or three stools of each sort ; so that he may take off his layers from kinds fitted to the soil.

Elm is an exceeding strong and sound wood ; and it is very durable either in places where it is kept always wet, or where it is always dry : but it does not bear sudden changes from one to the other. It endures a vast while in water pipes, which are always wet and under ground ; and in many of the common uses where it is never wetted at all, 'tis in a manner everlasting. Its toughness recommends it to the wheelrights and millrights : and it is useful for dressers and chopping blocks, because it does not break away in chips.

There is a vast difference between elm cut in the middle of winter, and at other times. The trees are to be cut off as close as possible to the ground ; and care must be taken about the fall, that they are not hurt by their own boughs, or things in their way, for they come down with a great weight by reason of their height.

It is by some an objection to the elm, that it is apt to be hollow : but this may in a great measure be prevented, by observing the directions already laid down, in the articles of the last removal and the lopping. Twenty elms become hollow by bad management, for one that is so from nature. The common occasion of this is, the cutting the leading shoot ; or some upright branch of the head ; or some nearly upright branch elsewhere : these let in the wet at the wound, and the decay which begins there, runs down to the bottom of the tree.

When a branch has injudiciously been taken off, which
VOL. I. Y endangers

- endangers the tree, the method is to cut it off again close to the trunk, and cover the wound with lead, or oil cloth.

As the elm so ill bears cutting off its upright branches, it does but badly take the topping for a pollard. 'Tis one of the worst trees for this use : but some will cut it in that manner. In this case many die in the operation ; and the rest, though they seem to bear it at first, commonly grow hollow soon after, and decay entirely.

When the farmer intends to use the shoots and branches of the elm as fodder for his cattle, he should cut them about August, and let the leaves dry upon them. These will keep till winter, and the cattle will eat them rather than almost any other food, and they thrive upon them extremely. Hogs will eat them green, and fatten upon them very quickly.

People who are fond of relating strange stories, have asserted that elms will grow from chips of the dry wood. This is not true, but what gave rise to it is a very familiar observation. Elms are often removed soon after they are felled ; and sometimes when they have shot out from the knots, as they will do when they lie on the ground. When these are squared for use, those knotty parts being trodden into the ground by the workmen, will shoot : but the rest of the story is not true.

The common broad leav'd elm in a rich and moist soil, will grow to a great bigness. There have been seen whole rows of them in hedges, that were three foot square for forty foot in height ; and there are authentick and unquestionable accounts of an elm in Oxfordshire, which near the ground was six yards in diameter. Dr. Plot who gives this account, mentions also a witch elm very nearly of the same bigness : he says it was at the lower end seventeen yards in circumference, forty yards high, and contain'd near a hundred ton of timber.

The elm is not so tedious in its growth as the oak, and the demand for its timber is very considerable, though the price be but moderate : the quantity used for water pipes is surprizing. There is therefore great encouragement for the husbandman to plant it. 'Tis easily done ; the expence is almost nothing : the ground it takes up in hedge rows is trifling, and it grows quick, and may be cut down at any bigness to considerable profit.

C H A P. XXII.

Of the ash, its proper soil and situation.

THE ash is a tall and stout tree. Its leaves are composed of several smaller, which stand on each side a stalk with an odd one at the end. The flowers are small and inconsiderable. They consist only of a few short threads. The fruit grows in other parts of the tree, and is what we call the ash key, hanging in bunches.

There is but one sort of ash wild in England, or fit to be cultivated for its timber. The gardeners have found the way to stain its leaves, and then call it the variegated ash. The flowering ash, and some other kinds, are also kept there for beauty; but with these the husbandman has no concern. There is one from New England with sharp pointed leaves, and another from Carolina with broad keys. The Italian ash which affords manna, is also distinguished by having rounder leaves; but with these he whose intent is to raise timber has no business; the common English ash is his only kind.

The favourite soil of the ash is, a light and rich mould, but it will grow any where: we find it in sandy ground, and also on rocky and stony; but when it has its own natural earth about it, the growth is much quicker. In a good soil there is scarce any tree that will in less time rise to so considerable value. A hundred years is allowed for the growth of the oak. But the ash will rise to its utmost perfection in fifty.

We see ashes on the most barren mountains; but they do not grow there either so quickly, or so regularly as in better ground. In general it may be proper to plant the ash on any soils, and in any situation, but the owner must make a right use of it when planted. The ash on barren hilly places, will grow to a very good coppice wood; but 'tis not a fit soil for planting it for timber. And in the most stony ground, it may be planted for pollards, and will yield a good quantity of wood in shrowdings, as well as maintain a firm trunk to the height, that is allow'd on those occasions: but it is only in the richer soils, and in more favourable situations, that it will grow speedily and profitably for timber.

One kind of soil has often been remark'd as favourable to the growth of the ash, this is the chalky: many trees

that flourish well on others, will grow but poorly on this ; whereas the ash, whenever it is seen on such a soil, has a healthy aspect ; and arrives very quick at a valuable size.

We advise the husbandman to look into the hedge rows of his neighbours, before he plants trees in his own, that he may see what kinds thrive best. As plain and obvious a thought as this may be, it is not follow'd. The work is done at random, and it succeeds accordingly.

The husbandman in Kent and Suffex, tho' he sees the ashes in his neighbours hedge rows fair and thriving ; and the elms in the same plantations, crooked, stubbed and hollow ; sets elms, and they grow stubbed like the others, neglecting the tree that he sees thrive so admirably.

Custom has been used to guide the husbandman in England, without his consulting reason, or even experience. We hope one good effect of this book will be leading him to use both in a proper manner ; and that seeing how necessary such a conduct is, and how useful, he will for the future try this custom always at their tribunal, and accept, or reject it, according to their sentence.

Too many of these trees must not be planted in the hedge rows of plow'd lands. The ash spreads its roots a great way, and, if not prevented, its branches also. When this is the case, the drippings from them hurt the corn, and when the pruning prevents this, still the roots spreading so near the top of the ground, take the nourishment that should support the crop : and another inconvenience arising from them is, that they obstruct the tillage of the ground by their frequency and toughness.

From these general observations on the ash, the husbandman will know where, and in what manner to plant it, and, when planted, how to manage it to the best advantage.

If he raise it on a bad soil, and in an exposed situation, let him use it as coppice wood, covering the ground either with ash alone, or with that and some other hardy kinds, and cutting them down first at twelve or fourteen years growth, and afterwards every seven or eight years. If he plant the ash on a hungry stony soil, let him throw it at the height of ten foot, and keep it as a pollard. When he has hedge rows on good light land, separating meadow and pasture grounds, let him set ash plentifully in them ; and never forget it where the soil is chalky.

The ash is a good tree in woods ; and indeed so profitable,

ble, that they should in very few cases be planted, without a large proportion of it.

The soil that agrees worst with the ash, is a wet clay : this tree will bear moisture, where there is not coldness and solidity in the ground ; for we see it growing at some small distance from rivers in many parts of Buckinghamshire, and it thrives no where more happily. The timber when felled, is whiter when it has grown in these places than in any others, but it has not altogether that strength it possesses in drier soils.

The ash is an enemy to all smaller growths. If planted too near gardens, it will starve the fruit trees, and hurt every thing that is propagated within the reach of its roots.

C H A P. XXIII.

Of the propagation of the ash.

THIS tree is best propagated by sowing : this may be done either where the trees are to stand, or in a nursery. The common custom of writers is to give one or the other of these methods as the best, without any exception ; but we hope to introduce a more reasonable practice. It may be most convenient to raise the young trees in a nursery for some purposes ; and for others it will be found best to sow them where they are to stand. Let the husbandman therefore conduct himself, according to the situation and design of his plantation.

Let him consider whether he intend to raise the ash in hedge rows, coppices, or woods, or in clumps upon exposed situations, as in parks, or on the naked hills where little else of value will stand : according to these several conditions, the practice he is most advantageously to follow, will differ.

For hedge rows, it is best to raise them in the nursery, and to remove them thither by two transplantations : if for clumps, or coppice woods, 'tis best to sow them on the spot ; but when they are to make a part of large woods, the soil and situation must determine, for on a very good soil they do best by transplantation ; but it is best raising them immediately from seeds, where the land is more barren.

The ash may be raised by layers, but it does not succeed so well : and the husbandman may purchase the young shoots, or suckers, from those who draw them in the

hedges, but these never rise to be such fine trees, nor grow so quick.

Which ever of the other methods the circumstances of the plantation require, the first care is to get a quantity of good seed. 'Tis in the farmer's power to collect it under all possible advantages. Let him fix upon a tall, lively and flourishing tree, and watch the ripening of its keys. When they are thoroughly ripe, let him send up a servant to shake the tree; and if they don't fall this way, as in some seasons they will, and in others they will not, let him see a quantity of the bunches cut off, selecting the fullest, best and largest.

If the trees be intended for hedge rows, or for woods, upon a very favourable soil, the seeds are to be sown in a nursery; but if for coppices, in clumps; for parks or in woods, on poor ground, on the places where they are to stand.

C H A P. XXIV.

Of raising ash in a nursery.

THE last week in October, the ash keys ripen. Let a small bed of earth be at that time well dug, and perfectly cleansed from all sorts of weeds. 'Tis best to chuse a piece of ground that has not been wrought before. The soil should be light but poor: an ordinary loam where there is choice, is preferable to any other.

When the earth is prepared by turning and breaking, let the ash keys be spread for a few days upon a floor of some airy room, where the sun does not come; and being thus a little dry'd, let them be sown thick in shallow trenches open'd a-crofs the bed, at four inches distance. Let the earth be drawn over them with a rake, and the bed made level. Seventeen months after they will rise in vast plenty.

While the seeds lie in the ground, as well as after they are up, the bed must be kept very free from weeds; and in the spring, if there are not frequent showers the plants should have a little water. Sometimes, if the keys be gathered very ripe, the ground fresh and good, and the season favourable, the ash will rise the first spring; but the seeds usually lie till the second, and we have therefore prepared the husbandman to expect it.

Authors insult each other upon their supposed errors about

bout the time of shooting of ash keys ; but truth may lie on either side, and those may write from what they have seen who contradict one another.

A bed must be prepared to receive the young trees from this first : for the ash requires transplanting from the first shoot, earlier than any other tree.

It is most beneficial to remove at six months growth.

Let a large piece of ground be dug for their reception, the autumn after their first appearance. Let trenches be open'd, at three foot distance, and let them be deep and wide enough to receive the young trees, without injury to their roots.

The ground being prepared let the young trees be taken up with care : The roots must be a little loosen'd with a spade, and then rais'd without breaking. The tap root must be cut off at a few inches length ; the rest must be left as they are : and the young trees in this manner must be carefully set in the trenches, at fifteen inches distance ; and the earth closed and press'd down about them.

They are to stand four years, and then be removed into their places : but in order to their growing regularly, some care must be taken of them while in the nursery. Weeds must be cleared away, that they may have all the nourishment the earth can give them ; and they must be trim'd up every winter.

Let the earth between the rows be dug up every spring : and at their first bringing into this nursery a little care should be employed, in seeing that they keep upright, and that the earth be well clos'd about them : this is best done by treading it down. Late in the autumn of the fourth year, they are to be removed hence into the hedge rows where they are to stand ; or to be brought into the new plantations of forests, where large holes are to be opened for them, and care taken to set them upright and keep them so.

The best distance in hedge rows, is about five and twenty foot. In woods intended for long standing, an ash may very well be planted, every third tree ; and nine foot every way is a proper distance.

If ash be rais'd alone, the best method is to plant the trees at eight foot distance, and at the end of the first year, going over the plantation to cut down every other tree at six inches from the root : chusing the worst shoots for this purpose, and leaving the straightest and best, standing.

This thins the plantation for the present to one half, and gives it a double kind of growth. The stems which have been cut off, will send up many strong shoots, which will grow into good poles in five or six years, fit for the hoop-makers; and they will at proper times, yield a supply of small ash in the manner of a coppice: all the while the others will be shooting up into beautiful and stately trees, which in thirty, forty, or fifty years, according to the nature of the soil, will be of great value.

The soil must determine whether the whole number left at this first reduction shall stand for timber, or whether they require to be thin'd again: if so, let this be done with discretion; and always the worst cut down for small wood.

When the ash is removed into its place, some of the side branches may be taken off, but the top is never to be cut. If that be to be done at all they must be cut down to the ground, and stand for a supply of poles, or at a greater height for pollards. For if the top be injured, they never make timber.

There is this advantage in the ash, that where it will not do for one thing, it will for another: and at any time, when it is seen that a tree will not thrive for timber, it may be cut off at six or eight inches, and will succeed very well. This may be done at any time, and the most sickly tree will revive upon it.

CHAP. XXV.

Of raising ash where it is to stand.

THERE remain yet some other plantations of the ash to be considered, as when it is to be a part of coppice woods, when it is to be rais'd in woods on a poor soil, either entirely of that kind, or mixed with other trees; and, when it is to stand in clumps in parks, or singly upon high and barren grounds. In all these cases the best method is to raise it where it is to stand, but there is a different way of doing this, to suit it best to the several circumstances.

When it is to make a part of coppice woods, some of the shoots should be cut for poles among the other kinds, and some left for timber.

The ash may be let into these coppices either at their first plantation, or after any of the fellings; the method is this.

When

When the growth of the other shrubs is at some height, let the husbandman go over them with a trowel, and some choice ash keys: the season must be the end of October, and the keys should be fresh gathered, and a little dry'd, as has been already directed. He is to open the ground with his trowel, in convenient places; and put in a few of the keys. These he is to cover with the earth taken up, to about half an inch depth, and then to draw the fallen leaves over the place by way of shelter. He is to introduce these where there is most vacancy, where the soil is finest, and where there is most moisture if the situation in general be dry.

They will shoot favourably, and the autumn or autumn twelvemonth following, according as they have shot the first or second spring, he is to examine his young plants, cutting off those which rise crooked, within five inches of the ground, and leaving the other for timber trees.

Thus will he thicken his coppice in a very easy manner, with one of the most valuable trees. Those he cuts off will rise in clusters of poles, to be cut down with the rest of the coppice wood at every felling: the others will grow well, and are to be left standing in sufficient number for timber. If they grow too close the woodman must cut down some of them, at the first felling of the coppice, leaving the stumps to supply the small growth of poles in the future cuttings.

If the coppice have been rais'd by planting from the nursery, the ash will not grow well in it, unless the soil be particularly good. Then as this tree requires a time of transplanting from its first beds, different from other trees; being much earlier, it is best to raise the supply of those several kinds without it.

'Tis also a quicker grower than the generality of others, inasmuch that if it be brought into the plantation long after them, it will rise to an equal bigness by the felling. The common growth of a coppice is from twelve to twenty years the first time; and these ashes will rise to very good and useful poles in seven years, after the cutting the shoots down to the ground.

When coppices are rais'd by sowing, the ash keys may be put in with the other seeds, and take their chance: they outgrow many of the other kinds; and there is no great harm in that. But this way of introducing them afterwards, is preferable. It fixes them in those places where they

they will thrive best; and the advantage before-named, of thickening the coppice with so useful a growth, is far from trivial.

In woods, where the soil is good, the ash may be brought in at four years growth, and will thrive very well, because as much as it is stop'd by the last removal, so much, or more, it will be assisted by the superior quality of the soil. But when that is indifferent; or perhaps worse than the ground of the nursery, it is best to sow the seeds there; for no trees succeed well on being transplanted, unless it is on a better ground.

As to ashes which are to stand singly, or in clumps in parks, or other exposed situations, they are best raised from the seed on the spot, for the same reason; the exposure checking them, if brought from a place where they were sheltered.

Let the ground be opened in every place where an ash is intended to be rais'd, to the depth of two feet, and the clods broken. Let about a dozen ash keys, of the soundest and best kind, be set in each place, and defended till they come up, by bushes laid over, or a low dead hedge carried round the spot. When they have shot let half of them be pull'd up, leaving the most promising; and after this, at different times, let all the others be taken up, except one; leaving the finest and most regular.

This must be carefully done, that the roots of the remaining tree may not be disturb'd. It is then to be defended by pales, or otherwise, and carefully trim'd up in the winter, to take off all straggling branches, and carry it up strait and regular. There is no doubt of thus raising fair and rich trees.

The common practice for raising an ash wood, is to plow the ground intended for that purpose, and sow the keys upon it, thinning them after they are of some small height: others sow oats with the keys, and gathering that crop at a proper season, leave the keys to shoot at their leisure, under the shade and defence of the stubble.

We have mentioned this method of sowing already, for the raising of a coppice; but for an ash forest design'd for the timber, it is not comparable to the before-mentioned, which very well pays the additional labour by the better growth of the trees.

The raising such ashes as are designed for timber upon the places where they are to stand, is, in these cases,

cases, vastly preferable. We would have timber trees of an even growth; and such they are if rais'd from seed in their places, because they meet with no stop; the nourishment yielded by the ground, being regularly conveyed to them: all trees have some stop at the time of transplanting; and none more than the ash. The ash, for the first year after its removal, makes very little progress: this shews the disadvantage from the removal; and how much better it is that the trees design'd for timber, should be sown where they are to remain.

C H A P. XXVI.

Of the lopping and felling the ash.

WE have considered the ash as a coppice tree, pollard, hedge row, and forest tree, in the raising; and it must be regarded in all these lights also to the end. It is frequently used in all the four kinds, and a method not altogether the same is to be followed in treating it. In coppices it is to be cut with the other wood, when rais'd in poles by taking off the shoot while young. When it stands for timber in these plantations, care must be taken it does not spread out too much into head, for the drippings would do a great deal of harm to the young growth.

When the ash is cut as a pollard, care must be taken to keep all its boughs at such a height, that they be out of the reach of cattle. The ash is a tree of quicker growth than most others, and the shrowds are to be cut accordingly, oftener than he would from most other kinds. He is also to observe carefully the state of the trunk. It grows hollow sooner than in many other kinds, and then loses its value: it yields fewer and fewer branches for lopping, and they grow more slowly. We therefore advise the husbandman to keep up a stock of these, by now and then planting fresh ones for this purpose, and cutting them off at a proper height. These being ready to take the places of the old set, let him cut them down as soon as they begin to be hollow. Thus he will have the benefit of their branches, as long as the tree bears them in quantity, and with vigour; and by cutting up the tree when it begins to shew the first signs of decay, he will have the advantage of so much good timber as it affords. The young trees should be planted, one between every two of the old ones; and the roots of the old ones grub'd up, that the young may have full

full liberty for spreading theirs : thus it will be proper to go on, always preparing a supply in time.

When the ash grows in hedges it must be lop'd carefully, and often : neither the loppings here, nor in the pollard ash, should be suffer'd to grow too large ; and the best season for cutting both is in spring. It must be prevented from having too large an head in hedges, to prevent its drippings, and it will thus rise into a regular tree.

In woods and parks care must be taken in forming the ash at first, but afterwards it requires no lopping. It must be carried up in a strait trunk in woods : but in forests it may be suffer'd to branch out from twenty foot or thereabouts. This takes something from the value of the timber, because of breaking in upon the length : but it gives the tree a finer head, and a more beautiful aspect, which is a thing regarded in those plantations : and the quantity of the timber is not lessened, though the value is in some degree abated, for these large arms yield a great deal.

The right time of felling the ash is the depth of winter, when the sap is altogether at rest : for when cut down at any other time, it becomes subject to worm-eating. It is to be fell'd in November, December, and January ; but best of all about Christmas : and the workmen must take care to cut it off as close to the ground as possible. If it be one that has grown in a park, or elsewhere, where the head has been indulg'd, the larger boughs must be carefully taken off while it is standing, or a great deal of the timber will be spoil'd in the fall. The best time of all for cutting small ash, is toward the middle of February.

C H A P. XXVII.

Of the uses of the ash, and its value in plantations.

THE growth of the ash, which is quick and regular, recommends it in plantations about houses and gardens : and the make of its leaves gives a great and pleasing variety. Those who are curious in trees should raise ash also in their nurseries, to bud upon it the several foreign kinds mentioned in the first chapter ; all those succeeding better here upon that stock, than when rais'd without budding.

No wood is so sweet in the bud as the ash, and for that reason there is none on which cattle so much love to browse. It is to be defended from them in young plantations, with great care, but it may be made useful in a proper manner, like

like the elm, for the same purposes. The cuttings of the ash feed deer in hard winters, and are acceptable to any cattle. Cows and oxen, when suffered to feed upon a fallen hedge, always devour the ash shoots before they touch any other; and when any other kind is offer'd to the deer along with it, they constantly give the ash the same preference.

The ash is valuable for fire-wood. No kind whatever burns so free or so sweet; and if the farmer have not a stock before-hand, none answers his purpose like this; for it will burn when fresh cut better than any other kind. This freedom of burning green, and the fondness of the cattle for the ash tops, are both owing to the same cause. There is a sweet juice with which the ash abounds, which is pleasant to the taste, and is very inflammable; these kinds of juices, as may be seen in common sugar, burning very violently.

The timber of the ash is of great strength, and is sold at a large price for many works. It is used in buildings: and by the coach-makers and cart-makers. It will remain sound a vast while when it can be kept dry, but it does not bear wet like some other kinds. There is a difference in the ash, according to its growth. The ground ash is very strong, and is valued for many purposes, although small. A bough of it exceeds any other, except the oak, in strength, toughness, and lasting. But there is, as in other woods, a great deal of difference between this and the quartered timber.

The carpenter and plow-maker in the country use a great deal of ash; and the wheelright finds no wood comparable with it for his purpose. The harrow, and most of the instruments in husbandry, are made of it. It serves excellently for hoops, and other parts of the cooper's business, and for the turner: some of it is so finely vein'd that it is used by the cabinet-makers, and is called green ebony. Poles of all kinds are cut out of the coppice from ash stumps. None are equal to them for the hop garden; and they are us'd for pallisade hedges, and a multitude of other the like works. Axles for wheel carriages are almost universally made of ash, and blocks for pullies, oars, and handles for tools.

Scarce any timber is of quicker growth, and none is of readier sale, for every bit of it will go to market, from the main trunk used for large works, to the smallest pole,

or

or the least piece of the quartered timber. Nothing can therefore be more advantageous for the husbandman, where there is a convenient piece of ground, than the raising a wood of ash alone. We have shewn the method, which is by sowing a proper quantity of the keys, and cutting off the least promising shoots while young, leaving the strait and fine at proper distances. In this management there is an annual income from the plantation, all the while the trees are getting their due bigness for timber. The underwood may be cut every six or seven years; and in a large plantation a sixth or seventh part every year, which will be of ready and good sale for hop poles, garden poles, and the like things. Wood for all these purposes is had from the stumps, each of which, as soon as cut down in the manner already directed, sends up a number of shoots, that in this time arrive at a growth sufficient for all those uses; and they are, after that, to be cut once in six or seven years with the same or greater advantage.

C H A P. XXVIII.

Of the beech, its best soil and situation.

THE beech is a tall, stout, and well-growing timber tree. The leaves are broad and short. The flowers are small and inconsiderable, they stand together in little bunches. The fruit grows on other parts of the same tree, and consists of two nuts enclosed in a rough hairy case. These nuts are the seeds of the beech: they are of a triangular figure; and their hairy case is divided into four parts. These fruits, all together, are what the common people call the beech mast.

Gardeners and nursery-men keep what they call the silver beech and gold beech, and the planters of curiosity tell us of the mountain beech, and the wild beech: this would lead an unwary person to believe, that there were three or four different species of beech, as there are of elm, but it is not so. As to the nursery-men's trees they are only the common beech, with its leaves variegated with white or yellow, like the other of their curiosities in that kind; and as to the mountain beech and wild beech, they are the same tree: the difference planters speak of, in the colour and firmness of the timber, is owing to the soil and situation, not to any thing in the species; for the same seeds will in different soils raise both sorts.

The

The natural soil of the beech is a dry, light, and warm land, richness of earth it does not require. Beech will thrive on the driest and most sandy soil; or among raw gravel or stones, nay almost upon rocks. In many places where there are beeches of a vast growth, one is, at first sight, astonished to conceive whence they have their nourishment; but upon examining their roots the wonder ceases, for they are found to penetrate to a great depth, and to spread a vast way when arrived at places where there is moisture and nourishment; as many other trees roots do, at all adventures, immediately under the surface of the ground.

As the natural soil of the beech is sandy or stony, the proper situation of it is on hills; but it thrives better on their sides than at their tops. Chalky soils suit very well with the beech; and, in general, those which are improper for the generality of other growths whether of trees or herbage.

The advantage to the publick and to private persons, would be very great if they would pay regard to nature, in their plantations of timber trees. Each has its proper soil in which it will always thrive; and there are so many kinds, that one or other of them will agree with any ground a man can have; and they will all bring a price. It is strange that people who are about to plant, will frustrate their own expectations, by suiting the trees to their fancy, not to nature. A few years since I saw more than six thousand elms planted on a sandy gravel, down the slope of a hill, where they must come to nothing, and where beeches would thrive excellently: and within these few years a husbandman in my own neighbourhood being about to raise a coppice upon a good, but somewhat damp piece of ground, would, against all advice, make a great part of the growth beech.

They contradict nature, and then wonder they have not success: they will not be advised, and when they fail by their ignorance, they cry out, who would plant! Let the person who is about to enter on this business, take his directions from experience, or from the collected maxims of it in this work, and no practice is so sure of success.

The plenty of beech in England, has led some to censure Cæsar, who says, there was none. But the Roman might be right; the elm, common as it is at present, is not a natural product of our island. There might be a time when

when there were no elms in England ; and yet, from the face of things at present, it would appear much more improbable to say this of that tree than of the beech.

What is understood to be the name of the beech in many of the old Greek authors, is really used by them to express the oak, as appears from their accidental mention of the fruit.

The beech is confin'd to some counties of England, being unknown in others. Nature has suited this tree to some particular soils and exposures, and as we have some counties mostly hilly and dry, and others, for the greater part, low and wet ; if the beech were universal in the one, and deficient in the other, it would seem reasonable, but there are no such reasons for the want of this tree in many places.

There are many counties as fit for it as those where it is most plentiful, where yet a tree of it is never seen : and many thousand acres of land in this kingdom on stony and chalky hills, are left useless, where the beech would prosper.

We hope to make the benefits of some parts of the island reach others where they are not known at present ; and there is none in regard of which this may better be done than the beech plantation.

It is in the power of many who lament the smallness of the produce of large tracts of land, to raise upon them growths of beech as shall make them exceed the most fruitful in profit.

C H A P. XXIX.

Of the propagation of the beech.

THIS tree may be propagated by seed, or from suckers, but the first way is the most eligible, always affording the best and fairest trees. The success also being much more certain, those who intend to plant any considerable number of beech, should never think of any other method. Where only a few are wanted, raising them from suckers may answer the purpose.

Those who plant suckers, buy them from the common people who draw them together with the elm, ash, and other kinds for sale : but as they take them up carelessly, and at random, good and bad together, we advise the husbandman who intends to spare himself the trouble of a nursery,

nursery, at least to draw them for himself, that he may chuse good plants, and such as have a good root.

When he has a sufficient number, let him plant them at once where they are to stand, and take care to open good holes in the ground to receive them, and to set them secure and steady, supporting them by stakes as they first grow up. He need not be uneasy at their growing slow for the first two or three years, or even at their rising knotty and crooked; they will out-grow all this; will afterwards shoot apace, and become strait and fine trees.

When a forest of beech is proposed, or a large quantity of them in parks, the best way is to raise them from seed.

There are two methods, the one by sowing them in a nursery, the other by laying in the seed at once, where the trees are to stand. We recommended the raising the oak in its place, because of the strait growth, and the ash, because its long root renders it less fit than many other kinds for removing: though the beech is liable to neither of these objections as to transplanting, because it will bear a removal while young; and will out-grow a defect in shape better than any other tree, yet there is substantial reason for raising it where it is to stand; which is the poorness of its soil. Trees must be rais'd on a poorer ground, than that where they are design'd to grow; but the proper soil for the beech is so poor, that the nursery cannot well be made poorer: and it is certain, a tree never does well on transplanting, unless it be removed into better ground.

If the nursery be still prefer'd, let a small bed be dug in a poor, raw, gravelly or stony soil, and some good beech gather'd from a thriving tree, and sown in it in trenches three inches deep, drawing the earth over with a rake. The bed is to be kept clear from weeds; and when the plants rise, they are to be watch'd, and in the first autumn after their shooting, some of them, where they grow thickest, are to be removed into a larger piece of the same ground: the next autumn, a second parcel are to be drawn out of the seed bed; and a third parcel, the autumn after that: leaving only a few at proper distances, as the others are placed in the new ground.

The remov'd trees are to be set in rows a foot and half distant one from another, and the rows a yard asunder: and they are to be kept there three or four years, digging between the rows in spring, and keeping clear from weeds.

This is the method where a nursery is used ; but the sowing upon the spot is preferable ; and in this some difference is to be observ'd according to the nature of the plantation. If a large tract of ground is to be cover'd with a beech forest, the plow is to be used ; but if some clumps are to be raised in parks, or other plantations, the spade is preferable.

When large plantations are intended, or where the trees are to be raised for beauty, a particular care is to be taken in the choice of the seed. The mast is to be gather'd from the tallest trees, and to be sown as soon as it has been a little dry'd, by spreading on the floor of an airy garret, not exposed to the sun.

For the sowing a forest, let the ground be twice plow'd, and well harrow'd ; and let the seeds be carefully scattered over it, and well covered. After this when they rise, let the weeds be kept under, and from time to time let the growth be thinned till the young trees are left standing only at nine foot distance.

After this let the planter go through them every winter, and carefully trim them up for timber trees, taking off such side branches as would draw the nourishment from the trunk.

In plantations, where beauty is consider'd as well as use, the spade is to be employ'd instead of the plow, because the ground is to be open'd for the seeds only in a few places, and they must be more carefully set and cover'd.

The beech should be thus allowed five and thirty foot distance every way. It will very well fill up this space, spreading into a noble form.

When the holes are open'd, the earth being well stirred, let five or six seeds be set in at three inches depth, and at equal distance from one another.

Beech seeds are very apt to be eaten by vermin, but if they are cover'd to this depth, they are secure.

When they shoot up, the weakest plants are one after another to be drawn, and at last one only is to be left in each hole ; which is to be defended, as has been already directed for the oak, and will not fail to grow up into a noble tree.

It seldom happens that any of such a plantation die ; but to provide a supply for such an accident, let some of the best of the young shoots that are drawn, be set out in a nursery

nursery bed, where being of an equal age, they will be ready to supply any failure in the plantation.

The trees are to be trim'd as they grow up; but at five and twenty feet they should be suffer'd to send out two or three large branches, for this makes the beauty of a tree for a park.

At this distance they will not in the least interfere with one another, and if the soil and situation favour them, they will grow to a surprizing height and bigness.

In many places the beech may be planted in hedges very profitable: as to the difference of the two kinds, the mountain beech, and the wild beech, both will rise from the same parcel of seed, only by sowing them in a different soil and situation. Those which he raises on dry hilly places, will be mountain beech; and the timber will be white and even grain'd. Those which he raises in lower grounds, and hedge rows, will be wild beeches; and the timber will be darker, and of a more uneven grain, but of a firmer substance, and more durable.

This tree requires less lopping than most others, for the greatest care is in the pruning it while young. When the tree is thus train'd to a proper growth, it produces few side shoots when in woods; and in parks it only spreads at the head, as design'd. When planted in hedges, it is to be treated as the ash, and other hedge row trees; and when cut for a pollard, which it may very well be, it is to be shrowded once in about eight years, and that always in spring. If the shrowding be suffer'd to grow too large, or be cut off in winter, the wet will get in and damage the trunk.

It is to be felled from the beginning of November, to the end of February, but the timber keeps best when it is cut in the depth of winter.

C H A P. XXX.

Of the uses and value of the beech.

THE beech is not to be look'd upon only as a forest tree, but as one for the garden: and in parks no tree exceeds it.

In gardening few kinds are so proper for the making large hedges to surround considerable plantations. It may, with due care, be kept very regular, and will be as beautiful as useful: but it is a very quick shooting tree, and

its young branches soon get strength: for this reason the gardener must cut his beech hedges twice a year.

There is another reason why the gardener should raise a stock of beech plants. They are useful for receiving the strip'd beech of both kinds, by budding or grafting; and it thrives better upon the wild beech stock, than when raised on its own.

We have not recommended the beech tree in coppices; because if suffer'd to stand there for timber, the drippings will prejudice the young growths after felling; and for the same reason those who have a proper soil for raising it in hedge rows, though they may do this to a considerable profit, must take care to lop it in such a manner, as to prevent the damage it may otherwise do by its shade, and the drippings.

On the sides of hills the beech flourishes best, and yields the finest timber: it will there stand against the strongest winds, better than any other tree, altho' the ground seem loose: this is owing to the roots spreading greatly at a considerable depth.

In moist soils 'tis the nature of the beech to grow slowly at first. When it has been thus for two, three, or four years spreading in root rather than top, it will begin to thrive, and will go on without stop or interruption till it be arrived at its full maturity, in which it exceeds most other trees in size.

The fruit called the beech mast, is a fine food for hogs, and many other creatures. Deer are fond of it; as also pheasants; and many kinds of poultry. It fattens them excellently, and their flesh is never better tasted. The leaves are light and dry, when properly cured, beyond all others. It has been a practice to stuff mattresses with them. There is another use to which the fruit of the beech may be put, that is, the pressing it for oil; a bushel affords a gallon, and it is so sweet and well flavour'd. that it may be eaten as oil of olives; and will serve for several purposes in which oil of a large price is used.

There was some years ago an undertaking set on foot for the making this oil, but it was ill contrived and injudiciously executed; so it fail'd: but that is no argument against the setting about it again upon better principles, and with wiser management.

Those who have thoughts of such an undertaking, are not to be discouraged at the small quantity of mast they will

will some years see on the trees. The beech does not bear regularly; but in general about one year in three is a good one; and the produce then is prodigious.

Such as are curious in observing the growth and success of fruits, have often express'd their surprize at the difference in quantity on the same tree in different years; and the more so as after keeping a strict watch of the season in that whole year, they have found nothing particular to occasion it.

There is no kind so liable to this uncertainty of bearing as the beech: the same tree in my neighbourhood having yielded some years not above six or eight bushels of mast, and some others fifty.

Those who enquire so far into the cause of this, as to examine the seasons of that year, should go a little farther back, and take notice of those preceding. The weather of one year will shew its effects in the fruits of another, especially in trees that grow on loose and open soils.

When one year has been wet, it has affected the fruit of that which followed, and particularly that of trees on loose and open ground: I shall mention, by way of instance, the vine. When one year has been very wet, if the vines be examin'd the next, they will be found to suffer by it extremely; for, notwithstanding there be ever so fair a promise in the spring, and the blooming season go on well, few bunches of those which succeed, will come to any thing. Gardeners, without seeing the cause, will, at the pruning season, be able to foretel a bad year at these times, the bearing shoots being poor and crude. On such occasions the first crop fails, and often a second is produced; but this is always too late in the year for its arriving at any perfection.

Whenever there is a very dry autumn, the next year there is plenty of fine grapes, let the season of that be what it will: and this is plainly the case in these shrubs, it doubly holds in respect of other trees which grow in loose soils, and bear irregularly. The bearing years of the beech are influenced by the preceding season, and may be fore-known accordingly.

The wood of the beech is put to various uses. The branches, as well as the worst pieces of the timber cleft, make a bright, clear, and pleasant fire. The small wood makes charcoal, and the ashes are prefer'd to many kinds

for making of glafs. Turners use a great deal of the well grain'd beech, for it cuts easy, and takes a good polish.

The large timber is used in many kinds of work. It will stand excellently in water, where it is always wet, but it will not do where it is wet and dry at times. The evenness of its grain, and its not being liable to split, recommend it to the joiners and cabinet makers. Our bedsteads in general are made of beech; and it is the common ground-work of those pieces of furniture which are inlaid with mahogany, rosewood, or other expensive kinds.

It makes buckets, trays, and other utensils, being easily kept clean, and not so liable to crack as many other woods.

There is also another use which makes a large demand for good beech, which is the splitting it into those thin boards of which ban-boxes, hat-boxes, and such other light things are made. These are in general made of the beech, because no wood splits so fine, or holds so well together. The splitting it for this use is a very pretty operation; it was invented abroad, and when the knowledge of it got into England, was for some time kept a great secret.

The shavings of beech are bought up by wine coopers, being useful in the fining of wines, and they are a very innocent ingredient.

The best and finest beech in England grows in Hampshire, from whence great quantities are sent up annually to London; it there is planted generally on a dry stony soil, and in high situations.

The beech would be a very proper, and a very beautiful tree for long walks and avenues, where the soil and situation are proper; for no tree affords a finer or more wholesome shade, it is therefore a wonder 'tis not more cultivated in general throughout the kingdom.

C H A P. XXXI.

Of the white poplar, its soil and situation.

WE have four kinds of poplar, though some of them are called by other names. In this chapter we shall treat of two, which are nearly of kin to one another, and are often confounded together. These are the white poplar, and that kind called the abele. These may very fitly be consider'd as two white poplars: the other two kinds are the

the black poplar, and the aspen tree, which differ considerably from these, and from one another.

The white poplar is a large tree, of an upright growth. The leaves are short, broad, and pointed at the ends. The flowers grow on some trees, and the fruits on others, whence the poplars of all the species are properly enough distinguish'd into male and female trees. The flowers, which grow on those called male trees, are composed of little leaves, and a great quantity of short threads; and the fruit which grows upon the others called female trees, is a sort of pod of a thin membranaceous substance, which, when ripe, separates into two parts, containing the seeds lodged among a quantity of soft downy matter of the nature of cotton.

These characters agree equally with the two species of white poplar. The white poplar has small leaves, and a rough bark toward the bottom: the abele has larger leaves, and the bark is smooth all the way up.

These are equal in value, but it is best to plant the abele, because it excels the common white poplar in beauty.

The proper soil for the abele is a moist rich ground, in a flat situation. They are excellent where there is plenty of moisture; and will grow to great advantage in many such places, where no other tree can thrive.

It is not a great while that we have got into a way of planting this tree in England; we learnt it from Flanders, where nurseries of poplar are as common as those of elms with us; and 'tis to be hoped the practice will become universal, for many an estate may be greatly improved by planting boggy places with this tree.

The willow is at present almost the only fen tree. But the poplar will thrive in most places where that succeeds, and is a much more profitable growth to the owner.

Nothing is more wanted in England than a general knowledge of timber trees; which would at once encourage the taste for planting, and making it successful. Few turn their thoughts to it; and of those who do, the most seem not to know that there are above three or four kinds in the kingdom. Their thoughts are directed to the oak, ash, and elm, or sometimes, but rarely, they take in the beech: if one or other of these will not do, the ground is declared not fit for planting.

Not one of these will grow on the rotten soil of a fen, but the abele will flourish there, and will yield the owners a vast profit.

A farther confideration is, the quickness of the growth, in which it exceeds almost all others.

One great objection to planting is the length of time requir'd to reap its benefits: but in the abele, a very few years raises vast trees, and there is a ready market.

A man must not look for the full advantage from an oak plantation in his own life; and for that of an ash or other quick-growing tree, as they are called, he must wait forty years; but as to the abele, eight or ten years raise it to a very profitable bigness, and it arrives at the full growth in less than twenty. It ought to be then fell'd, and a young plantation prepared.

Not only the profit of such a plantation, but the beauty and ornament it affords, which are very great, speak for its being fell'd at a proper time: after this the trees grow knotty and unhandfome; and they then every year decrease in the value of the timber, which consists greatly in the evenness of the grain.

The abele makes a beautiful avenue; but the trees, even in this case, should be fell'd at their full growth, others having been planted between to succeed them. Their roots should be stub'd up, to favour the growth of the new plantation; and in this easy working ground their value, as fuel, will pay the expence. An avenue may be thus kept up from generation to generation, and always in vigour.

Tho' this tree is proper for an avenue, it must not be planted near a garden; for it would have all the inconveniences of the elm and ash together, and more: its roots would spread over the garden-ground like the ash, and rob every thing of nourishment: they would send up suckers every where like the elm, and spoil both grass and gravel; and beside this the downy matter about their seeds will cover the place with a litter that is very difficultly removed, for many months together.

C H A P. XXXII.

Of the propagation and uses of the white poplar.

TH E S E trees may be rais'd from seed, but it is altogether needless, as they are to be had many other ways, with less trouble.

They may be propagated either by layers or cuttings of any kind; by suckers drawn up from about the old trees; or by stakes; which take root as freely as a willow stick.

The

The way by layers is the best : it will always afford the evennest and most beautiful trees ; and these take root easily, and bear transplanting well. When a man intends to raise only a few, he may be content with suckers ; and when he is in haste to have a good shade, he may use the method by stakes, for they shoot up quickest of all, though they make the least beautiful trees.

Suckers are best taken up in the middle of October, and being then planted in the places where they are to stand, they will quickly arrive at a good height.

If this be not quick enough, and the method of stakes be prefer'd, let them be cut at about six foot length, and of the thickness of a child's wrist. These are to be struck off by one sloping blow at the bottom, and thrust fifteen inches deep into the ground. And no farther care need be taken of them.

To raise the abele by layers, the stools must be planted in a rich and moist ground, and treated as the elm : these will yield a continual supply of beautiful and well growing plants, which being removed into their place, will, in half a dozen years, be thirty foot high, and as thick as a child's waist ; they will sometimes shoot nine foot in a season.

The quick growth, and beauty of this tree, are sufficient recommendations ; and the uses of the wood are many.

None requires so little seasoning, for none shrinks so little : nor is any wood less affected by the weather. All timber will swell and shrink with the different heat and cold, and moisture and dryness of the air, but none so little as the abele. For this reason it is fit for many uses about houses, to which also the whiteness of the timber, and beautiful grain recommend it, though it be deficient in hardness. What could be prettier than to see the floors and wainscot of a neat country house of this wood, which would have the great advantage never to shrink or swell, and would be kept clean and beautiful without paint.

The wood is excellent for turnery ware ; nothing works more easily and freely, nor does any thing answer better for the several kinds of dishes, bowls, and other wooden vessels. A large quantity of it is used by the bellows-makers ; and it is the wood of which shoe-heels are made, because it is light and tough.

The lightness makes it also supply the place of cork, on many occasions, as for the floating of nets ; and where a
great

great deal of strength is not required, it has the advantage of many other kinds of timber, as for making carts.

The loppings are tolerable fire wood, and the poles that grow up strait and regular serve the hop planters.

Where birch is scarce they sometimes make brooms of poplar twigs, but for this service the black or aspen are more proper.

C H A P. XXXIII.

Of the black poplar.

THE black poplar is like the white in flowers and fruit: but the quantity of downy matter in the fruit, is more than in any other kind. The leaves are smaller and rounder than those of the aspen, and they are of a dark shining colour, and its twigs are of a deeper hue, and longer, slenderer, and of a tougher substance.

The black poplar loves a rich and moist soil, but it will bear a little dryer ground than the white, and will thrive in more exposed situations. The planter should therefore make his choice of the kind, when he intends to raise poplar trees, according to the situation and condition of the ground. Where that is low and rich, it is indifferent which he chooses; but where it is a little higher, or less damp, he must prefer the black. The trees are so much alike in their growth, that they may be planted together, with this little distinction, and it will never be regarded in the appearance.

The white poplar will do best on the fens, and the black on those bogs which lie between hills: but as these bogs are often wetter than the fens, the black poplars should be planted about the skirts and edges, and then the white and aspen may be planted in the middle, where there is firmness enough to support them: they will thrive very well there, under the shelter of the others.

Bogs between hills are often too wet and soft to support the roots of any tree, if not prepared by a little draining; but this may usually be done at a very slight expence.

The black poplar may be propagated by any of the ways laid down for the white; but the method by layer is best: in this kind it is so far the more proper, as this will not always take root altogether so freely as the white.

For those who will not be at the trouble of a nursery, the suckers may be taken up from the roots of old trees;

trees ; and in want of these, very good trees may be rais'd by planting small cuttings : these require care, and should be shaded at first. The cuttings should be eighteen inches long, and planted a foot deep in the ground.

The timber of the black poplar is like that of the white, but firmer. The turners prefer that of the abele to the other kinds, which they distinguish by its whiter colour, and more even grain ; the common white poplar they esteem next to that, and the black last : but the difference is not great. Where some strength is required, the black is to be prefer'd to either of the others. They make wheelbarrows and light carriages of it in Flanders, where it is more common, and these last very well : none are so light except of the other kinds of poplar which have not sufficient strength, unless worked up in a particular manner, and with a larger quantity of timber, so that they lose one way what they get another.

The wood of both poplars are used by the carvers, but they prefer the black for the nicest works.

C H A P. XXXIV.

Of the aspen tree.

THE aspen tree is a kind of poplar, and is call'd by authors who write on trees, the poplar with trembling leaves. It resembles the poplars in the flowers and the fruit ; but its leaves are rounder, and they stand on long, slender foot stalks. This is the reason of their trembling motion with the wind, and which makes them agreeable in the view of buildings. There is something so pretty in this tree, that one is surpris'd it is not rais'd more frequently.

The least wind sets the leaves in motion, and as they grow thick upon the tree, they rattle against one another, and the noise is like that of a distant waterfall.

If we add to this its quick growth, in which it resembles the other poplars, its regular appearance, when kept in order, and the value of its timber, should be enough to recommend it.

Its natural soil is a rich and moist earth, and it thrives best in flat and level places. But though one of the watery trees, it is not so strictly as some others confined to that situation, or soil : it will succeed tolerably on higher grounds, and where there does not appear any particular dampness.

dampness. I have observ'd, however, that when it thrives in these places, there usually is a clay at bottom.

In such places the husbandman may plant the aspen tree with a fair prospect of advantage; and in low places that are not too wet, he will never be disappointed of its thriving quickly. It attains its growth sooner in these situations, but the timber is better when it has grown on higher grounds. It is never to be raised on gravel, sand or chalk, for it will make no progress, nor will the wood be good.

The aspen is best propagated by layers, which take root readily, and a sufficient supply of them may be had from a few stools, as directed under the article elm. Such as want only a few trees, may therefore raise them from suckers, taken up in the middle of February.

They will stand very well in rows, avenues, or clumps; and may be planted on proper soils in hedge rows; for their dripping is not so hurtful as that of many other trees. They are a good addition to coppice woods; in whatever places they are planted, they should be trim'd up for trees, not cut for small wood, or lop'd as pollards; for they do not yield a good fire wood, the young shoots being too spongy.

This is a fault also of the black poplar, and of the common white: the abele is the best of the class for fire wood, and that but indifferent.

When the aspen is first planted, the side shoots must be trim'd off, and the tree rais'd with a naked trunk; its timber part will grow apace, and the head will be large and beautiful.

Though the aspen is not quite so speedy in its growth as the other poplars, it rises sufficiently quick into a fine tree. From five and twenty to two or three and thirty years may be allowed, according to the differences of the soil, for the time of its growing to maturity.

It is to be felled in the end of November, and the timber is fit for many uses. It is called for in some places by the builder, and answers very well in beams and boards: in general where it is most known, it is the most valued, for there are many of our counties where it is only seen here and there a tree, and gazed at for a rarity, because of the motion of its leaves.

Chair frames and tables are made of the wood in many places; and in some it is split into pales for parks, and laths

laths, for malt kilns; the turners use it for bowls and dishes. Trenchers are also turn'd of it, but it is not so fit for this use as many other woods: it is white and light, but the grain is too loose.

In some counties they cut it off for small wood, among the other coppice kinds, but it is where they don't understand the right management. Its principal uses, when of this size, are for hoops, for fuel, and for burning into charcoal, but it does not answer well to any of them, the hoops are too brittle; as to firing, it smothers and smoaks, and the charcoal made of it is but poor.

We name this freely, that the husbandman may not be misled by such writers, as copying one another instead of consulting experience, set down these for the uses of the aspen wood.

C H A P. XXXV.

Of the Sycamore.

THE tree we call sycamore, is of the maple kind, and has been more properly named the great maple.

It is a large, stately, and fair growing tree. The bark is tolerably smooth, and of a dusky brown. The wood is soft and whitish; the leaves are large and beautiful, they are broad and divided in a pretty manner at the edges. The flowers are thready and inconsiderable; the fruit is like the ashen key, but larger: upon the whole, few trees are better calculated for ornamental planting; so that 'tis strange it is not more generally used.

The natural soil of the sycamore is a rich but light mould, where there is some moisture, but it is not confined strictly to this. We have in many parts of England, instances of its succeeding on gravelly and stony ground; but best when there is water near.

The best situation for the sycamore is a flat, for it loves water; but it will grow on hills, and will bear to be planted near the sea, where scarce any other tree will grow. It bears the spray, and by its breadth of leaf, defends any other trees from it in the summer; and 'tis of so quick growth, that its body and arms soon become qualified to do the same service in winter.

This is worthy the planters particular notice, he has not only a tree that will succeed, where otherwise he could
make

make no plantation; but it will defend those of any other kind under the same disadvantage.

The sycamore may be raised either from seed, or by layers, or suckers. The first is the best method, and this succeeds most happily of all, when the trees are sown on the spot where they are to stand. It does very well either of the other ways; layers are produced from stools in great abundance, and root easily; and the suckers grow readily: but the trees raised from the last are usually inferior to the others in beauty.

The seeds ripen in great abundance about October, and are to be sown immediately after in good earth. If they are raised for removal, they should be sown in trenches three inches deep, drawn at small distances; if on the place where they are to stand, half a dozen keys are to be laid in a hole dug for that purpose, and cover'd three inches deep with mould. They shoot up the next spring, and grow very quickly.

If they are sown in a nursery, they must be removed the next October into another part, and planted at a foot distance, in rows two foot and a half asunder: after two years growth in these, they may be planted where they are to stand.

Whether it be raised from seeds, layers, or suckers, the idle branches are to be trim'd off for the three or four years succeeding the last transplantation; and after that they may be left to nature. The same method is to be observ'd with those raised on the spot where they are to stand. Of those which spring up in each hole, only one is to stand; the others are to be pulled at different times, and the finest left. This is to be trim'd up that it may grow to a body: and if these holes are dug at five and twenty foot distance in a double or treble row, there will in a very few years be a beautiful plantation.

The gardeners keep a sycamore with leaves strip'd with yellow, and this has somewhat singular in it: the tree bears its fruit very regularly, and if its keys are sown, they always produced strip'd trees, which is not the case with the generality of these artificial beauties.

The sycamore is not one of those trees that produce a good small wood, nor indeed do any of the soft kinds: it is for that reason we have advis'd the raising it always with a trim'd trunk for timber. The small wood does not burn well, but the timber has many considerable uses.

The best time for selling the sycamore is in the beginning of December; and 'tis useful to have a fresh stock of trees raising between the old ones, that may thrive and grow up when those are gone. This is an easy method, and should be practised in all quick growing trees.

The shade and shelter of the sycamore is excellent; and it will resist the strongest winds. In some places we see them in hedge rows, but rarely, though wherever it is seen 'tis counted a great beauty. The only part of England where it is common, is the bishoprick of Durham: they have there from time immemorial been used to it, and plant it in hedges, walks, and about houses.

When the soil suits, it will grow to a vast size. Trees of five, six, or seven foot in diameter are not uncommon, and at this bigness they are frequently found throughout. It reaches this size much quicker than the generality of trees: for in the common course of nature, those whose wood is soft, arrive at their bigness sooner than those the wood of which is harder.

The timber is white, and of a beautiful grain. It is used by the turners, for platters, bowls and trenchers, spoons, ladles, and other of the small utensils of the kitchen. Some have used it in the inside-work of houses: it is not very strong, but it shrinks little.

The sycamore may be transplanted when very large, only too much head must not be left on: it soon recovers the loss by the axe, growing, when once rooted, very freely. When the head or large branches are lop'd, the wounded place must be cover'd over with a cap of lead, or oil cloth; or with a mixture of clay and dung, otherwise it very easily lets in wet to the destruction of the tree.

Bees are very fond of this tree, it is oftener cover'd with a honey dew than any other kind whatsoever. For this reason also it is frequently over-run with insects: this honey dew is their food, and where the food is they will be found.

C H A P. XXXVI.

Of the lime tree.

THE lime is a large, and naturally a well growing tree. 'Tis often injur'd by cutting into foolish forms, but in its own growth it is very beautiful. The bark is brown and smooth, the wood light and fine; the leaves
are

are broad and roundish, but that they end in a point. The flowers are of a pale whitish colour: each is compos'd of several leaves which stand hollow. There is a longish leaf on the stalk of each bunch of flowers, and the fruit is a small double seed vessel of a testiculated shape.

There are three kinds of the lime tree cultivated here.

1. That with larger leaves called the common lime. 2. The small-leav'd lime; and, 3. That with red twigs. The leaves of this last kind are a little hairy, and the fruit is square. There is also a strip'd lime tree common in the nurseries, and some others not worth the planters notice.

The best soil for the lime is a rich loamy earth; but it will grow in others. Too much moisture is an enemy to it, and so is excessive dryness. Where the soil is a cold clay, the lime should not be planted; where there is a poor gravel, or a very stony land, it is not fit for the lime. But in a gravel with a mixture of loamy earth, such as are the best of the gravelly soils in Buckinghamshire, it thrives very well.

This is the more needful to be observed, because the bulk of the tree depends upon it: and it is for this reason, few now grow to a proper maturity.

In sandy soils the leaves come out a fortnight sooner than in others; and in wet, clayey and cold lands, they fall two months before their time. This may be a mark to the planter, whether the soil suits the tree. The too great forwardness of the leaves is as bad a token as their too early decay.

In such soils the lime will live without flourishing; and those who have seen it only in those, will not know what may be its value. The lime, in a favourable soil, will grow to ninety foot in height; and has been measured twelve, fourteen or sixteen yards round the trunk, and entirely sound.

It is not only here and there a tree that thrives thus: whole plantations rise to ten yards round with great regularity; nor is the lime one of those slow growers, that reserve their profits for another generation.

The husbandman will see what may be the advantage of planting this kind when he has a proper soil. For, as the timber is of considerable value, such a quantity as is contain'd in trees of this height and bigness, is an article very well worth his regard.

The lime loves a situation somewhat raised. It will grow

grow on hills ; but a small ascent, with a due depth of some free soil, is the place of its greatest thriving.

It may be propagated by seed, by suckers, or by layers ; but the last method is best. If any chuse to raise it from seed, he must gather this in the end of October, when it is fully ripe, and from a thriving tree. He is to lay it up in sand till February, and then sow it in a nursery bed, from whence the young trees are to be removed the first autumn into another bed, and thence transplanted into their proper places at four or five years growth.

Those who want only a few trees, may raise them from suckers from the roots of the old ones, chusing the straitest and best, and setting them at once where they are to remain ; defending them by a hedge, or bushes, till they have some strength.

The best way is to raise them from layers. The stool must be planted in a deep light soil. The shoots are to be laid in September ; and the September following they must be removed into beds four foot distant in the rows, and two foot from one another. They are to stand in these four years, and then to be removed to the places where they are to remain, after which they require little or no farther care.

While they stand in the nursery it will be proper to dig up the ground every spring between the rows, and to take off all the large side shoots, leaving only the small ones to detain the sap.

There is little difference in the timber of the three kinds of lime. The small leav'd sort yields the hardest wood : the other two shew scarce any difference. They bear more moisture, and a lower situation, than the small leav'd one ; and by this the planter may be directed in the choice of his kind, suiting it to the ground.

The lime may be transplanted at a large size, by taking it up with a ball of earth about the root ; but to ensure the success, the head should be cut off. The wounded part must be secured by a covering of clay and dung.

The beauty and free growth of the lime have recommended it for walks and avenues ; and the fragrance of its flowers is a great consideration in its favour, but the leaves decay so soon that many are displeased with it. 'Tis one of the first trees that puts us in mind of winter, and in an improper soil much sooner than in others. Its leaves will sometimes fall in the end of August, so that it is a

month or five weeks sooner than the generality of our other trees. This disagreeable circumstance, together with the litter such a number of leaves make, has banish'd it from many gardens; but, in a proper soil, the planter will not find the advantage less, because it wants something in the article of pleasure. To answer those disadvantages that have been named, it has two great benefits: scarce any tree bears the fury of the winds better, or is less liable to ordinary accidents; and it is very little apt to grow hollow.

In many plantations one sees the elm shatter'd by winds, and decay'd within; while the limes in the same place, tho' they have grown longer than was needful for profit, are entire, sound and flourishing.

The wood of the lime is light, and of a good grain, and not liable to split. It cuts easily, and is excellent for carvers. It is the common wood used in making of models; and the turners make a great deal of their ware with it. The farmer and husbandman prefer it to others for many of their implements, as it is very light, and yet of sufficient strength: and 'tis fit for paling, and the other common uses of timber.

The gun powder makers are fond of the coal of the lime tree, they always use that of some light wood, frequently the alder, sometimes the willow, but none answers so well as this, because a well-burnt piece of the charcoal has the qualities of the wood, and is light and strong both.

C H A P. XXXVII.

Of the walnut tree:

THE walnut tree may be considered by the gardener on account of its fruit, but the value of its timber gives it a fair title to stand among our list of trees raised for that purpose: it will be very well worth the husbandman's while to plant it for this, independently of any other consideration. The quantity, as well as the price of the timber, is a great article in this account.

It is a large spreading and beautiful tree. Each leaf is composed of several others standing on the two sides of a middle rib, with an odd one at the end. The bark is of a pale brown, and smooth; the wood is firm and beautifully vein'd. The flowers are little and inconsiderable, they hang in strings, and are composed of some threads

threads and chaffy leaves: the fruit consists of a green ill-tasted rind, a hard shell, and, within all, the kernel cover'd with a thin membrane. This fruit does not follow the flower in its place, but grows on another part of the tree.

Authors mention six or eight kinds of walnut, and distinguish them by so many distinct long names, but these are only variations made by culture; and the planter needs not regard them. There have been some distinct kinds brought from America, under the name of hickery, but the planter has nothing to do with them. If they be equal to the common walnut tree in the timber, they want the advantage of the fruit, for theirs is of no value; and this, though a trifling consideration, yet need not be altogether neglected.

There are some who prefer the hickery wood to our walnut tree; but if they are fairly compared together, the English walnut will be found to have the preference. The wood of the hickery, and especially of the black kind, is harder than our walnut, but it has not the toughness: it is often beautifully vein'd, but not comparably to the finest of the English.

The small white hickery, has the advantage of quick growth; but the wood is not equal to that of the other.

We have enter'd thus far into the difference of these trees, to prevent the husbandman from being deceived by such as are half acquainted with them, and are always more positive than those who have searched deeper. He may be told that the Virginian walnut is a quicker growing tree, and has a harder wood than the English, and this may tempt him to plant it in preference; to his great loss. 'Tis fit he should be inform'd, that it is one kind of this foreign walnut that is of quicker growth than ours, and another that has harder wood: as also, that he would never be able to sell either of the timbers for English walnut-trees, to an experienced cabinet-maker; or to get nearly the price for them.

The walnut tree thrives very well in a dry soil, and will bear a gravelly or stony one without languishing, but its favourite earth is a deep and rich loam. We have some grounds in Surrey, where there lies at six or seven foot deep, a bed of a chalky marle. There are walnut trees planted on these, and they thrive greatly.

Let the husbandman search after a light but firm soil

for his walnut trees. They will rarely deceive his expectation any where, but on such lands they yield their full advantage. A cold clay is to be avoided; nor is the walnut to be planted where there is too much moisture. Its branches keep the ground at all times cool and damp about its roots, and wet does not evaporate well in shaded places.

The timber of walnut trees that have grown in a chalky soil, or in a very light and sandy loam is best; and that is always worst which comes from trees that have grown in the way of too much moisture: this makes the wood less firm, and hurts the colour.

The proper situation for the walnut tree is a little rising; the tops of hills are too bleak; and the low and flat grounds are apt to be damp.

The walnut should be raised from seed, that is, by sowing the nut; and it should always be sown in the place where it is to stand. The common practice is to raise them in a nursery, and remove them at four years growth, but this is prejudicial to the planter. Nursery-men will tell the farmer walnut trees are better which have been removed, but there is a difference in his design from what the nursery-man intends. In the transplanting a walnut the tap root must be cut, and this stops the upright growth of the tree, making it spread into branches at a small height; and such trees are best for bearing of fruit, which is all the nursery-man thinks of: but it is the interest of the person who plants for timber, to have the tree rise to some height, with a good trunk; and in order to this it must never be removed.

The walnut tree should stand in a plantation at five and thirty foot distance, and may be set in two rows forty foot from one another. Nearer will not do well.

Let some sound fruit of the common walnut, be collected from a tall tree, when the green rind begins to crack.

Let these be laid in a tub, with the rind on, and with some dry sand about them, till the next spring.

In the beginning of February let the ground be mark'd out for the plantation, and a hole of two foot wide dug in the place where each tree is to stand. The earth being well broken and put into the hole again, let eight or ten walnuts, taken out of the sand, be carefully set in it at equal distances, with the green rind on, and cover'd three inches deep with earth.

From

From the number thus set in each hole, there will rise three, four, or more trees. These are to be carefully taken at different times, till only one is left in each spot, and that the most thriving plant.

Care must be us'd not to disturb the root of the tree that is to stand, in the taking up of the others: the earth must be closed about it when they are taken up, and a little sprinkling of water allowed for the setting of the mould thoroughly about the small fibres.

When the tree is left single it must be defended, by bushes planted round it, not by paling, for that hinders the free course of the air; and the walnut is found to require it more than any other tree.

The farmer raises his tree for timber, and 'tis his interest to carry it up in a good trunk: but no tree bears the loss of its branches so ill.

Such boughs as wou'd spread from a small height, must be carefully removed while it is very young; for the taking off a branch of any bigness will endanger the tree. If that should be needful, it must be done just at the fall of the leaf, and the branch must be cut off smooth and even, close to the body: the trees will soon yield a profit from their fruit; which will give the planter patience to wait for the growth of the timber.

No general direction can serve for the propagation of all kinds of trees for timber. Each has its particular nature, and demands more or less a particular management. The practice for the raising several kinds, are the same in general; but they vary altogether in the particular instances.

It is common in those who raise walnut trees from the nut, to lay a square piece of tile under the nut, at two or three inches depth. The intent is to stop the strait root, and make it break and spread. This is right in the raising the walnut tree for fruit; but altogether wrong when it is intended for timber, because the long or tap root, in that case, is more useful than all the rest.

The walnut tree for timber should be planted only in one or two rows, and that at a due distance: in this case being carry'd up to a proper height in the trunk, it is to be left to spread as nature directs; and never to be lopped. If any one shall chuse to set it among other timber trees in a wood, it must be lopped up to a great height, and thus it will fare like the rest, and grow very well among them.

The walnut may be planted in tillage ground, but at

a great distance. These trees in corn lands standing at a hundred and forty foot distance do no harm. Their roots penetrate deep for nourishment, so that they neither rob the crop, nor lie in the way of the plow. They thrive excellently in these places; the frequent stirring of the land contributing to their growth, and they are a defence rather than an injury to the ground.

Walnut trees rais'd thus serve excellently for avenues, and in other regular plantations: and when rais'd merely for gain, on grounds of little value, they are beautiful as profitable. The largest plantations of walnut trees in England, are in Surry; and the owners find so great advantage in them, that they take care to keep up a continual supply.

The husbandman is to take care that the soil be not sandy underneath; and that the situation do not expose them too much to cold winds; with this caution the plantation will never fail, though according as the soil is more or less favourable, the growth will be quicker or slower.

As the fruit of these trees is not to be neglected, we shall caution the farmer against a vulgar error. 'Tis said that the walnut tree is the better for beating; but it is false. As it would be tedious and difficult to gather wall-nuts by hand, people got into a custom of beating them off the branches with poles; and from the general practice, they came, at last, to think it was useful to the tree. Tho' beating may be allowable, it is not to be commended: and he who has a due care of his trees shou'd see it be done as gently as possible.

A great quantity of leaves are beat down with the fruit, and those had better be swept away than trampled into the ground: for there is something in the juice of the walnut leaf not favourable to the soil. If, after these leaves and the broken small branches are swept away from under the tree, some fresh ashes be scattered over the ground, they will assist both the tree itself, and all that grows about it.

If any other kind of walnut tree be desired, that which is called the black Virginian kind is the best. It will do on our soil as well as on its own native one: but it is a slow grower, and the fruit is of no value. The wood is pretty, being mostly black and white, but it is brittle.

The walnut timber so much valued in France, and called Grenoble wood, from the place where it is rais'd, is no other than the common walnut. It bears the large
French

French walnut for fruit, but this does not, in any thing essentially, differ from our common kind.

The time of felling the walnut is toward the end of November: and its value depends so much upon the accidental course of the grain, that it is impossible to make a judgment of it till the tree is cut down. Walnut timber is always of a certain price with its least beauty, but when the grain runs fine it encreases the value beyond computation.

This veining of the wood is finest in the driest soils, and in such trees as have been longest in attaining to their growth.

The French use the timber of the walnut in building: with us it is, in a manner, confin'd to two or three trades, who employ it in smaller works. The cabinet-makers use the greatest quantity, and the finest: they use it sometimes solid, and often in enlayings. The part which is not beautifully vein'd is used by coachmakers; and the stocks of guns are made of it.

The finest grained part is that nearest the root: but in general, where one part is good, the rest has its beauty, though in an inferior degree.

C H A P. XXXVIII.

Of the horse chesnut tree.

THE horse chesnut is cultivated for its beauty, not for the value of the timber: however, as it is a quick grower, the quantity will, in some degree, make amends for the defect of goodness; and as there are places where it will thrive, that will scarce do for any other trees, in these it may be worth the husbandman's while to plant it.

It is a large tree, regular in its growth, and at its flowering season of uncommon beauty. The bark is of a deep brown and rough, the wood soft and whitish. The leaves stand several together at the end of a single foot stalk, dividing like fingers. The flowers are white, with a bluish of red, and grow in spikes. The fruit is contained in a prickly husk, and is large and brown.

The nurserymen raise horse chesnuds with strip'd and blotch'd leaves, white and yellow, but these are only varieties of the common kind. The tree is a native of the east, but it bears in our climate perfectly well.

The proper soil of the horse chesnut is a light rich earth ;
A a 4 but

but it will grow in sandy, gravelly, or stony land; and particularly where there are large beds of sand underneath, which will not suffer other trees to thrive. In these places it will be profitable to plant the horse chestnut; and it will succeed whatsoever be the situation; though its most favourite one is the side of a hill.

The horse chestnut may be propagated by layers or suckers, but it is much best to raise it from seed. This may be done in the nursery, or in the places where it is to remain, but the latter is much the better way. The ground is to be marked out for this purpose, and a hole opened at every thirty foot distance: into these, when fill'd up again with their own earth, are to be put the seeds, gathered in their state of maturity, from a flourishing tree. Four or five should be put into each hole at a distance one from another, and when they have shot, the worst plants are to be removed, leaving only one at last to grow. These are to be trim'd up till the boughs will be out of the reach of accidents, and then left to nature.

The quick growth of the young branches of this tree has surpris'd many. At the shooting season they will all uniformly grow an inch in a day and night: but the whole growth of a year is performed in eighteen or twenty days: all that is done afterwards being only the giving these young shoots strength and firmness.

The horse chestnut naturally becomes pyramidal, being largest at the bottom, where the branches begin, and smaller all the way to the top.

As the tree is regular in its shoots, there is no need of lopping to bring it into form. The time of felling it is during the whole winter: but it is of little value, more than for the fire. In some places they make the implements of husbandry of its timber; and if there were not plenty of other kinds, it would probably be more used. The branches make good faggots, and the trunk cleaves into billets. It burns better than any other of the soft woods: though not so well as the hard kinds.

The fruit has a pretty appearance, but is of no value: abroad they give them to horses and other cattle in their provender, partly as food, and partly as a medicine against disorders in their lungs. We pay no regard to them, tho' there is no doubt of their being a wholesome and good nourishment.

CHAP. XXXIX.

Of the chesnut tree.

THIS is superior to the former in every respect; the timber being excellent for many uses, and the fruit pleasant and wholesome. The other has been called by the same general name of chesnut, because of some resemblance of the fruit in colour and shape, and in the outer covering; but the trees are different in every other respect.

This is a tolerable large, but not a beautiful growing tree. In that respect the horse chesnut has the advantage, as also in the flowers: but the leaves of this are very handsome: they are large, long, of a fine bright green, and indented beautifully at the edges: they stand singly, not severally upon the same stalk. The bark of the chesnut tree is brown and tolerably even, the wood is firm and dark coloured. The flowers are small and inconsiderable, they hang in strings: the fruit is the common chesnut which we eat: it grows upon a different part of the tree from the flowers, and has a rough or prickly husk. Two or three chesnuts are contained in each husk.

There is but one kind of this tree the planter is to regard, but that is very worthy of his notice, because the fruit is valuable as well as the timber. Our nurserymen raise a small kind from Virginia, called the chinquapin; and they stain the leaves of the common kind; but the little sort is not worth planting, and the strip'd leaves of the other are only an accidental variety.

It is an advantage in the chesnut tree, that it will grow in any soil or situation. It thrives best in a sandy loam, on the side of an hill, but it may be rais'd in gravelly, stony, or chalky ground; and will stand the strongest winds in the highest situation; for it roots very deep, and does not carry so tall and large an head as many other trees.

Too much moisture will hurt the growth: it will much better bear a dry and harsh land. But it will live almost any where; and bear great quantities of fruit in the worst land. Even wet is not an utter enemy to the chesnut tree, unless when it is detained about its roots. A moist gravel is a very favourite soil for it: the clayey bottom of a soil that will not let water run off, is the most destructive of this, and of other trees that don't affect moisture, for it chills and rets their roots.

The

The chesnut is to be rais'd from seed ; and the fruit so far enters into the consideration as an article of husbandry, that a great part of the expectation of good trees is founded on the choice of it.

The chesnut ripens its fruit very well in England, but the planter should not raise his stock from these. We import yearly a great quantity from Spain and Portugal, for the service of the table; and these are to be prefer'd to those of our own growth for setting for trees.

Let the farmer purchase a quantity of these at the season of their coming over, in winter. Let him buy twice as many as he will have occasion to use ; and lay them carefully up till spring, where they will neither be too dry nor too moist, and where vermin cannot come at them.

In the beginning of February let him examine them, by throwing them into a tub of water. Part will sink to the bottom, and part will swim. Those which swim are naught, the others are sound.

They may be rais'd either in nurseries, or in the places where they are to stand. But as the fruit is some consideration ; and the timber is not so valuable as in some others, it may be as proper a method to raise them in the nursery, and transplant them afterwards.

The place for the nursery being chosen in a poor ground, let trenches be opened in the second week in February, four inches deep, and six inches asunder. Let the chesnuts be planted regularly in these, one every four inches, with the eye uppermost ; and let the earth be drawn over them.

Make a dozen of these trenches should be made, and then a space left by way of alley, to get between and clean them : then another bed of six rows ; thus proceeding till a sufficient quantity are planted : there are usually some who will be glad to buy the young trees at a small price, which takes off from the expence of the nursery.

Traps must be set all about the ground for vermin.

They will appear above ground in two months, and are then to be kept clear of weeds; and to stand two years. At the end of this time they must be taken up and planted at two foot distance, in rows a yard asunder. The long tap root is to be cut off ; and care taken not to injure the others.

The best season for transplanting them is early in March, and care is to be taken of their growing upright and strait, by trimming off the side shoots ; or where they will spread

too low, by cutting them down near the ground, where there is a bud. They will shoot up from this a single strait shoot, and become fair and flourishing trees.

After they have stood here four years in this, they may be removed into the places where they are to remain.

The chestnut is a good tree for avenues, for clumps in parks, and for many other plantations, where the beauty of the leaf, and value of the fruit are regarded. They may be set at about twenty foot distance, and will afford a considerable store of timber.

This is used by joiners and cabinet-makers. At one time 'twas a custom to employ it for beams in houses. At present 'tis more used in small works, and for tables, beds, and chairs.

In some places they make wine casks of it, and it is said to give less taste to the wine than many other woods.

It has much the appearance of oak when dry'd and cut out; and the smaller purposes of oak are answered by it. They make laths of it as regularly as of the oak, and the workmen purchase them at the same price. In those old buildings where chestnut timber has been used, many a workman has been mistaken, and passed it over as oak on examination. It will bear to lie continually in water, and is therefore used in mills and sluices; but where it is at times wet, and at others dry, it soon comes to nothing.

The timber of the chestnut is season'd by dipping it in boiling oil; and if after this it be pitched over, there is no end of its lasting.

When the chestnut is planted in coppices, it affords strait, strong and even poles, for the hop planters. But the timber; although it has the appearance of the oak, is apt to grow rotten; and will often have a very fair appearance on the outside, when there is only dust within.

C H A P. XL.

Of the service tree.

THE right service is a tall and beautiful tree; very well worth planting for its timber. There are two or three other kinds which are called by the same general name, and they agree in the nature of the wood, as well as in the flowers, and the shape of the fruit; but they vary in the shape of the leaf, and the degree of goodness. These are distinguish'd by the names of the service tree, with the fruit

fruit red in the middle. 2. The short fruited service ; and, 3. The wild service or quick beam.

The first is the most valuable, and the two next come nearest its nature. The last differs more, and as it is not generally accounted of the service kind, but called by a distinct name ; I shall treat of in a chapter by itself. The flowers of the others are much alike, they appear early in spring, and the fruit is rough to the taste.

The best soil for the service tree is a firm loam. Such soils are common at the foot of hills, or on any gentle ascent. When the soil is too light, the trees grow slowly ; and when it is too dry, the fruit is ripen'd very poorly, neither do the leaves stand their time. When the service is judiciously planted, it grows quick, and answers very well to the husbandman ; but when the plantation is made at random, none does worse. Few know its value, because few have given it a fair trial ; nor is its timber so much known, or so common to be had, as it ought to be, for this reason. He who will fall into the method of raising these trees, will do a service to the publick, as well as to himself : there needs but a beginning to incite others. The consequence would be a ready market for the timber, and it would prevent the importation of a great deal of foreign fine wood ; which, however called by sounding names, is inferior to that of the service tree in beauty, and in value.

The service may be raised from seed, but the best way is by layers, which take root freely, and are produced in great abundance. The method of raising trees this way, has been laid down under the article of the elm. Those who raise them from seed, must sow them in shallow trenches, in a nursery, and keep them clear from weeds. At two years old they must be planted out at a yard distance, and three or four years after that, be set where they are to stand. Those who want only a few trees, may raise them from suckers transplanted early in spring.

Which ever way this tree is rais'd, it should be carefully trim'd up for the first eight or ten years, that it may not spread into branches till a certain height, when there will be a handsome trunk for timber.

It is a proper tree for avenues, clumps and hedge rows. Its beauty should be an inducement to plant it, and its quick growth and valuable wood to the husbandman.

The grain of the wood is fine, and its variegations are often exceedingly pleasing. It is excellent for the cabinet-maker,

maker, the turner, and the carver, being soft, and yet sufficiently firm. The stocks of guns are sometimes made with it, and escrutores, chairs and tables. It also serves for many of the small works; and when properly oil'd and varnish'd, imitates and supplies the place of the foreign woods in several of the ornamental pieces of furniture, and nice instruments.

C H A P. XLI.

Of the quick beam.

THE quick beam, or, as some call it, the quicken tree, others, the wild service, or the flowering ash, is properly a kind of service. It is one of the least of those that are accounted timber trees.

The bark is pale and smooth, the leaves are beautifully form'd, each being composed of many smaller, which are long, narrow, and finely dented at the edges. The flowers stand in great bunches at the ends of the branches, and are whitish, large and handsome: and after these come beautiful berries red like coral.

It is native of England, and is a great ornament to coppices and hedge rows, in those counties where it is most frequent. It is taken also into gardens, where it makes a fine figure in the wilderness quarters.

The best soil for it is a light and dry loam; and it grows best on a rising situation. No tree is better suited to thrive in hedge rows, where the soil is fit. It roots firmly; and shoots up in a moderate time to its full stature.

The best way of raising it is from seed. The berries are to be gather'd when full ripe, and sown after they have been spread a fortnight in a dry airy garret. They shoot up freely, and the plants should be removed from their first bed at two years growth, and planted at two foot distance. Three or four years after this, they are fit to be transplanted to the places where they are to stand. A small nursery will thus, with little trouble, raise such a quantity as will stock a large piece of ground; where being set in hedges, or the banks of coppice woods, and other such places, they will quickly grow to some value.

Those who would only raise a few trees, may take up suckers from about the old ones, for they rise in abundance, and grow freely.

The quick beam should have very little trimming or lopping:

ping: as it is not to be carried to a large tree, 'tis best left to nature, the branches of themselves growing with a pleasing irregularity.

Few of our trees are more hardy than this; or better bear the cold winds: the farmer who has a light soil in such an exposure, as few other trees will bear, may plant this, which will be a shelter to his grounds, and after a few years may be felled to advantage, taking care to raise young trees between the old ones for a supply.

The best time for felling it is in November, for at that time the wood is in a manner all heart.

The timber is tough, and not heavy. It is used in all sorts of carriages, from the wheel-barrow to the coach. The farmers make many of their implements of it; and it answers their purpose so well, that it would be worth their while to plant it much more generally.

C H A P. XLII.

Of the birch.

THE birch is a tree of a moderate size, quick in its growth, and of a pretty appearance. It answers many purposes in the affairs of life, though not of the most important kind; and produces the owner a tolerable profit.

Its bark is smooth and glossy, its leaves are roundish and of a fine green; the twigs are red, and they are very slender and knotty: well known to school-boys. The flowers are small, and hang in catkins like those of the hazel. The fruit grows on other parts of the tree, and is a little light cone. This tree naturally casts its outer bark every year.

The birch is a native of our country, and seems indifferent to all kinds of soils and situations; it will live on sandy hills, and in the rottenest bogs: and will stand in hedge rows, though its best situation is in coppice woods. No soil is too barren for it. But for quick growth, and the best return of profit, he should plant it in the damper parts of some coppice woods.

The birch is best raised from suckers. These are produced in great plenty about the old trees; and are to be taken up in February, and planted where they are to remain. They take root freely, and shoot quick: but when they have stood two years in their new place, they should be cut down four inches from the ground. The fairest and
straitest

straiteſt ſhoot is then to be preſerv'd, rubbing the reſt off: in this manner the birch will riſe to a tolerable tree. But it is not worth while to keep it to any great growth, for the timber brings but a poor price.

The beſt time for felling birch is the end of November. No tree abounds ſo with ſap in the growing months, and 'tis beſt to cut it when that is moſt down.

The timber is light, but has ſome ſtrength. It is uſed for light carts and yokes, and many other things in the farmer's way, for it works eaſily, and is tolerably laſting. Turners uſe the large wood for bowls, diſhes and trenchers: and the leſs uſeful part makes excellent charcoal. Brooms are made of the twigs: a great deal of birch is raiſed for this purpoſe, and near large towns yields a very conſiderable profit.

If birch is intended for this uſe, when it has ſtood one year it is to be cut down to the ground, or within a few inches of it; and all the ſhoots are to be ſuffer'd to grow. Theſe ſoon become fit for hop-poles, and furniſh abundance of twigs for the broom-man.

Hoops are in ſome places made of the poles, and bakers panniers frequently of the timber. Smallcoal is generally made of the bruſh wood of the birch; though any other light wood answers the ſame purpoſe.

Of the ſap of this tree is made wine. It bleeds the moſt freely of all our Engliſh trees, and its juice is not only the moſt in quantity, but the beſt of any for this purpoſe. The time of tapping the tree is in the beginning of March, the juice which runs freely from the wound being work'd up with ſugar, makes that agreeable liquor called birch wine, or with honey birch mead.

There are two ways of getting the ſap; the one by boring a hole in the tree, and the other by cutting off the ends of ſome of its branches. When a hole is bored in the trunk, a piece of chip is to be ſet againſt it to guide the ſap into a veſſel put to receive it; when the ends of the branches are cut off, they are to be let into quart bottles, a great number of which may be hung upon one tree, and will quickly receive their quantity of the ſap.

The ſap runs moſt freely in the middle of the day, and in the warmeſt weather. A ſouth weſt wind ſets it a going; and a north or eaſt makes it drip much more ſlowly. This, when made into wine, is a pleaſant and wholeſome drink,
and

and has a considerable effect in sweetening the blood; and curing the scurvy.

CHAP. XLIII.

Of the horn beam.

THE horn beam is a regularly growing tree. Its bark is brown and tolerably smooth, and the wood is firm. The leaves are short and indented at the edges, they are somewhat like those of the elm, but of a more beautiful green. The flowers are small and inconsiderable: they hang in catkins like those of the hazel; and the fruit, which is dry and light, grows on a different part of the tree.

There are four kinds of horn beam raised in nurseries. 1. The common. 2. The hop horn beam. 3. The flowering horn beam; and, 4. The horn beam with striped leaves. The husbandman who would plant for advantage, has nothing to do with any of these except the common kind.

The common horn beam is a hardy tree, it will grow in the worst soil and bleakest situation. It is proper to be planted on the top of cold hills, and in places so exposed, that other trees will not grow on them. It will thrive very well in hedges, and woods; and is excellent for clumps in the bleakest and worst parts of the parks.

The best way of propagating it is by layers, as the elm. It may also be raised from seeds, but this is a more tedious method. If the seeds are prefer'd, they must be gather'd in September, and sown three weeks or a month after, laying them in the mean time in a dry airy place. They will sometimes come up in five or six months, sometimes they will lie till the following spring. They are to be thin'd soon after they appear, and kept clear from weeds, and at two years old they are to be removed to another part of the nursery, where they must be planted at a greater distance. Three or four years after they are to be finally removed, and set where they are to remain. The method by layers is much more expeditious, and the trees grow as beautiful that way as the other.

The horn beam is very fit for the garden as well as field: scarce any tree makes a better hedge. When intended for this use, it is to be trained up flat; but when planted for timber, it should be trim'd up to grow with a
good

good trunk. The hop horn beam is better for the garden than the common, because this does not drop its dead leaves so readily, but they hang on in winter, and are an ill sight. In hedges it bears clipping, rises to a great height in a moderate time, and will be thick and close at the bottom. It roots firmly, so that it stands the force of winds; and is a good shelter to the other growths.

The leaves, beside their beauty in shape and colour, appear early in spring, and continue long green in autumn. One of the greatest beauties of Versailles, is the height, beauty, and regularity of the horn beam hedges.

The farmer will find his account in this tree, whether he plant it in hedges, coppice woods, or on waste grounds; and whether he train it for timber, or cut it for shrowding. He should carry it up for timber in his better soils, and shrowd it where the ground is poor. The branches shoot quick, and afford a good fuel; and the trunk cut down at a proper time, gives useful timber. In coppice woods it bears the dropping of the trees left for timber better than most other kinds.

The small wood makes good charcoal. The timber is pale, firm, and strong; but of an uneven grain. It is used for many purposes where strength is requir'd, more than beauty. Nothing is better for mill cogs: the heads of beetles and mallets are also made of it; and the turners use it sometimes for the stronger and coarser ware. The worse parts split make excellent billeting.

C H A P. XLIV.

Of the maple.

NOtwithstanding the smallness of the maple, it is a valuable tree.

The sycamore is only a large kind of maple; and this common kind resembles it in flowers and seeds; and, in some degree, even in the leaves. The bark of the maple is brown and rough: the leaves are broad, and deeply divided at the ends. The flowers are small and inconsiderable, and the fruit is a kind of keys.

In nurseries they raise several foreign maples, as the Norway and Virginian; but the English planter need not regard any but the common.

The best soil is a good mellow earth, with some sand: it does not thrive in tough or in light soils: but it will live

in any. The best situation is in hedge rows on the sides of hills. It will live in coppices and woods, and may be brought to a great value.

The maple is best raised from seed. The keys are to be gather'd when ripe; and pick'd from the flourishing trees. They are to be spread upon the floor of a dry airy room ten days; and then sown. Any waste piece of ground does for a nursery, the poorer the better; and they are to be sown pretty thick in trenches, at small distances, and lightly cover'd with mould.

They shoot early the next spring, and require little care. At a year and half old they must be planted out at two foot distance, and three years after that is a good time to remove them to the places where they are to stand.

Let the farmer avoid wet places, and for the rest he cannot do much amiss, chalk, sand or gravel will feed the maple: only in these poorer soils, he must not expect it to grow to any size. When he has a good soil, let him train it up to a tree thus.

Let him take off all large side shoots, leaving only a head and a few little branches to draw up and detain the sap. He will thus bring it to better form than it is commonly supposed capable of, and will greatly encrease its value.

He is never to shrowd the maple, or favour its spreading; for the droppings from it are hurtful.

The maple is a slow growing tree; but it makes amends in the beauty of the timber, the finer pieces are of considerable value.

The wood is of a close and beautiful grain: it cuts easily, and has a firmness that holds it together in small works, whence it is valued by the turners and carvers. When it happens to be vein'd, it is used for fine works by the cabinet-makers, and in inlaying.

They make gun stocks; and it is turned into cups, spoons, trenchers, and dishes, all very beautiful.

The timber of the pollard maple is most curl'd; but it grows hollow soon in this form. There is no depending upon its soundness, except when 'tis a standard tree.

Maple wood heretofore bore a great price, the Romans held it next the cedar. The knotty parts are most vein'd; and what is called French maple, is no other than the irregular parts of the trunk of an old maple, that happens to keep sound. That wood which is near the root in an old tree

tree is also very beautiful : and sometimes there stand knots from the surface, which, when cut through and well polished, have a fine variety of veins and marblings.

The Norway maple is hardy, and may be cultivated without difficulty. It will be easier rais'd to a large tree than ours : but its wood has not that excellence. It more resembles the sycamore.

In North America, they make sugar from the juice of the maple : it may be done here from the juice of the sycamore.

C H A P. XLV.

Of the cherry tree.

THE cherry tree affords a good timber ; and might be worth planting for that, were there no other advantage. It is a large and well growing tree, when carried up to an height by trimming.

The bark is brown, and smooth ; the leaves are large, longish, and shining, the flowers are white, or reddish, and the fruit is roundish, with a kernel included in a hard stone. We have many kinds of cherry, but there are two principal, the black and the red ; and to one or other of these all the other sorts are to be refer'd ; the black cherry being small, and the red large. The heart is of the red kind, and the variety of others do not deserve the notice of the husbandman, who means to plant the cherry as a timber, as well as fruit tree.

The black cherry naturally rises thus to a tall and well-shaped tree, and the red may be brought to it. They may be rais'd without trouble, and will yield profit enough to the planter. The others are cultivated by budding or grafting into the wild black or red cherry stock ; because those are free shooters ; this shews the husbandman that it is his interest to plant them : for the free shooting, and quick growth of a tree are to him articles of the greatest consequence.

The best soil for the cherry is a loam : it does not require a rich earth, but it will not bear the two extreams of clay or sand. In clayey soils its roots are chill'd ; and in the sandy they are burnt, but on any other ground it will grow very freely.

It will grow in any situation, but it does not thrive well when too much exposed, as on the tops of hills. It is ob-

served to shoot the quickest, and arrive at its bigness soonest, where there is a good degree of moisture; but the timber is most valuable when it has grown on a dryer ground.

The cherry is to be propagated by sowing; and the best kind is the black. The stones should be saved from some of the best fruit of a large and tall tree, and us'd soon after they are gathered; they should be sown in a piece of poor ground, in trenches, and covered two inches and an half with the mould. When they shoot, the young trees are to be thinn'd, and kept clear from weeds, and at a year's growth they should be removed into a larger bed, and planted at eighteen inches distance, in rows two foot and an half asunder.

They may be planted afterwards in hedge rows, orchards, parks, or warrens, and the proper distance is about five and thirty foot; the best way is in rows, and these should be forty foot asunder. Thus they may be train'd up to useful trees of timber, and all the time they will afford a constant profit from the fruit.

Cherry trees in many parts of England stand in the hedges, and where the property is secured by custom it is a very good method; but in places where idle people will make free with the fruit, the trees will be broke in the gathering it; and the hedges spoiled.

It is better, in these places, to plant a poor field with them by way of orchard, and the ground may be tilled between them, while young, as if it were clear. The caution in such a plantation is, that it be defended from westerly winds. The more the trees are carried up for timber, the longer the ground may be tilled between them; for when suffer'd to spread at a small height, they shadow the whole ground, and injure any thing sown upon it by their drippings.

There is farther reason for carrying the cherry tree up for timber at present, for the fruit bears so small a price it scarce pays the charges of gathering in a bad year; and affords little profit in the most favourable.

Both the black and the red train'd up for timber, by cutting off the young branches that would spread too much, and carrying the tree to a top, will grow large, regular, and beautiful. They make a good appearance in avenues, when rais'd for that purpose. The cherry in orchards is an ill looking tree, but this is not so much in its own nature,

ture,

ture, as the manner of cultivating it. A well grown cherry, when in blossom, makes an elegant appearance, as also when in fruit.

When the cherry tree is transplanted from the nursery, the usual way is to cut off the large down-right roots: this prevents the trees rising in height, and makes it spread into branches: but the contrary is the design when the tree is rais'd for timber; therefore the long root is, in this case, to be left entire, and the top shoot never shorten'd.

Those who want a few trees may raise them from suckers, from the roots of the old ones, but it is a much better way to sow the stones, for the trees are always the fairer.

We see certain kinds cultivated in particular places, and some have supposed they thrive particularly there; but there is nothing more in this, than custom. Red cherries are cultivated in Kent in such plenty, that they have obtained a name from the place; and in the same manner black cherries seem peculiar, in a manner, to Hertfordshire. But I have seen as good black cherries in Kent, as in that county; and have eat Kentish cherries in Hertfordshire as fine, and from as fair trees, as any in the country from which they are named.

The red cherry requires a richer soil than the black. The husbandman should guide himself by this; not planting black because in one county, or red because he happens to live in another; but the red if his soil be better, the black if it be worse.

The season for felling the cherry tree is about the middle of November; and the value of the timber depends upon its being cut at a proper time.

The woods of the red and black are very much alike, but that of the black is finest, it is not only valuable for its beauty but its strength. It will grow to an height and thickness in the trunk, to afford good beams for building; and they are equal to any timber, except the oak: it is also fit for the cabinet-maker as well as the carpenter.

Of all the European woods none so much resembles mahogany. These trees are rarely raised for this purpose; and that what is called cherry tree wood is cut from the red or black cherry indifferently, and just as it happens a tree has been cut down; but under these disadvantages chairs and tables are made of it, which have an appear-

ance of that elegant wood, and the resemblance might be brought much nearer by proper care.

Mahogany is not of its beautiful colour when first cut. Time gives it the greatest value, and when it is fresh wrought into cabinet-work, they rub it with several things to stain it. They use a red earth, dug in the isle of Wight : and from the colour it gets by this, and well oiling, it becomes of that hue we so much admire. Let a piece of timber from the sound trunk of a black cherry tree be wrought in the same manner, rub'd with the same red earth, and oil'd as the mahogany is, and it would be found nearly equal in beauty.

Is it not worth the planter's while to raise a tree which will be next to the oak in strength, and next to the mahogany in beauty ?

If the size of the timber be objected by those who have not much observed the tree : we inform such, that there are black cherry trees in the hedges in some parts of Hertfordshire, of a fine thickness and height in the trunk ; and when it shall become common to raise it for the timber, we shall see larger and finer. There is nothing in nature to prevent it ; most of the form of trees is owing to the management when young.

The cherry tree will grow in woods, and though it bear little fruit will rise strait, and with a tall trunk ; nor is any tree fitter to be mixed among coppice woods, for it does little hurt by its shade.

C H A P. XLVI.

Of the pear tree.

WE are here to mention another tree which is so generally looked upon as a fruit, that it is rarely considered as a timber tree, although its wood is, in many instances, superior to any other. We hope to remove it from the orchard to the hedge, and to shew the husbandman he has as much reason to value what is called the worst kind, as the gardener has to prize the best.

The pear tree, when properly managed, is large and tall. The bark is rough, the leaves are roundish, and the flowers resemble apple blossoms, but they are whiter. The fruit is naturally small, longish, and larger at the end farthest from the stalk. Art has brought in a multitude of varieties of tastes, colours, and names of pears, but the huf-

husbandman has nothing to do with these. He is to consider the tree for its timber, and the only kind that should be planted for that purpose is the common choak pear, called in some places the wild pear: from this all the rest have been produced by culture; and it is that of which perry is made. It grows freely in hedges, and will easily be trained up for timber.

It will grow in any soil. It bears a moderate degree of moisture, without any injury, but too much will hurt the timber before any visible sign of decay appears on the leaves or branches.

It will grow as well on flat ground as the sides of hills, but it does best where there is a depth of soil. The pear tree is best raised from seeds. For this purpose the husbandman is to mark a fair tree, and gather the fruit when full ripe. A poor piece of ground is to be chosen for a nursery, and the trees are to be rais'd and train'd up, as directed for the cherry. Only taking great care on the last removal, not to injure the main root.

The pear tree thus will grow to a considerable height, with a strait and single trunk, before it begins to bear any fruit; but when it has once began, the produce will be yearly very great; and the fruit, though poor in taste, will yield a great profit, if made into perry, which is easily done; for the vintners and wine coopers are always ready to take it in any quantity.

The quantity sent up to London was never yet enough for the demand.

While the trees are enriching their owner yearly by their fruit, they will be growing up to timber. A proper supply of young ones should be planted against the time of felling, that they may yield fruit when the others are gone. If they are planted in hedge rows, forty foot is a good distance; and four or five years before the old ones are to be felled, there should be brought a supply of about six years growth from the nursery: these should be planted one between each couple of the old ones.

The timber of the pear tree is of a fine grain. It cuts easily, and takes a beautiful polish. It is equal to any for the finest works of the turner; and the carvers are fond of it. It is in some places wrought into tables, chairs, and other furniture. In the beauty of its colour, closeness and evenness of grain, and yielding to all instruments in working, it is superior to any wood whatsoever. There

is at present a certain market for it; but if the supply were greater the demand would rise in proportion.

C H A P. XLVII.

Of the hazel.

THIS is a tree of small stature, but it properly follows the other fruit kinds; and notwithstanding its smallness, has sufficient value to make it worth the husbandman's regard.

The hazel is a low shrub with broad indented leaves, and a brown smooth bark. The flowers are in a kind of catkins. The fruit grows in a different part of the tree, and usually in clusters of three or four together.

The filberd is the hazel improved by culture; and beside this we meet with a little white nut hazel; a great or cob-nut hazel; the red filberd; the white filberd; and lastly, the great Spanish nut, which is angulated on the surface. These have been raised from the common hazel, and are not worth the husbandman's regard, he is to stick to the natural wild shrub, leaving these to gardeners.

The hazel is a hardy shrub, it will grow on the poorest soils, and stand in all exposures. This is a great article in its value, for it will succeed where other trees would fail. It will grow in the toughest or the loohest soils; in clay, and in sand; and flourishes very well in stony grounds. But the soil and situation that suit most perfectly with it, are a fresh light earth, on the side of a hill.

Many propagate the hazel from suckers, but the best method is from seed, and this is so easy, that 'tis not worth while to take any other.

Let the husbandman gather a good quantity of nuts when thoroughly ripe, from the most flourishing trees. Let a bed of sand be spread upon the floor of some cool room, and these nuts laid on it, covering them with a little more dry sand. Thus they are to lie the whole winter. In February they are to be sown in trenches, in a poor ground, and transplanted when they are of two years growth. They are to stand a couple of years in their new place, and then to be removed to the hedge rows, or elsewhere, where they are to remain.

When a coppice is raised from seed, the nuts may be
sown

sown among the rest; or it may be thicken'd afterwards by transplanting more of them into it.

Nurferymen propagate their filberds by layers; but though this may be the best way, when they are raised for fruit; the sowing is best for other purposes.

After they are removed to the places where they are to stand, they must be cut down within five inches of the ground. They are pretty large when they are removed, this may be done the first year; but if smaller, it is better let alone till the second.

When they are planted in coppices, they are fit to fell with the rest of the growth, at twelve or thirteen years old; and, after the first cutting, they may stand seven or eight years.

No shrub answers better for the thickening of a coppice, by laying down a branch. One long pole chop'd half through near the ground, and cover'd for its whole length five or six inches deep with earth, fastening it down with a peg, will yield a row of fine shoots.

The hazel, when cut at ten years growth, yields a good price. It is esteemed by the hoop-makers, and on many other occasions; and, in some parts of England, is raised singly in very large plantations for this service. Its fruit are a great disadvantage, for they occasion its being broke and torn to pieces by boys, before it is in a condition to cut. This is a great reason against planting the hazel in hedge rows, where else it would thrive very well and grow to use. Not that it is by any means a good shrub for the serviceable parts of a hedge, for it does not grow close, nor does it bear plaishing: it also wants thorns.

'Tis best to raise it singly in plantations for the hoop-makers, or among coppice wood. It is used also by the thatcher, and for the making of hurdles. Its fine taper shoots are used for fishing rods, and the worst of it is very good for faggoting.

The small branches of the hazel burn to a fine light charcoal, and are, in some places used for making gun powder. The chips are used by the wine coopers, and are a very harmless ingredient for the fining of wines.

C H A P. XLVIII.

Of the buckthorn.

THIS is another shrub, whose fruit is of value : indeed of so much, that one is surprized the husbandman should not think it worth while to give it generally a place in his hedges. It will, in a tolerable soil, grow as freely there as any other kind ; and it answers the purpose of fencing better than many that are constantly planted there from custom, and without any particular reason, or any tolerable use.

It is a shrub of ten or twelve foot high, the bark is brown and smooth, the leaves are oblong, and the flowers are small. The fruit is a berry, roundish, black when ripe, and juicy, containing four hard seeds, which are rounded on one side, and flattened on the other.

The people who gather the berries frequently, though very dishonestly, bring those of the black alder, and some other shrubs among them : the berries of the black alder most resemble them, but there are only two seeds in each.

The buckthorn loves a light and rich soil. We see it in hedges on other kinds of ground, but it does not flourish when it has not free room to spread its roots, and plenty of nourishment. For situation, a flat toward the bottom of a hill is the best ; but there is no need to be very strict in these things : it may be planted among the quick of a hedge any where ; only if there be choice of soils and situations, it will bear its fruit more plentifully and constantly, and it will ripen it better on these than others.

It is to be propagated by sowing : and for this purpose the berries should be gathered from a thriving tree late in autumn, when they are thorough ripe ; and sown immediately in shallow trenches, in a bed of a loamy and light soil.

When the young trees first appear, they should be watered a little, if the season be dry, and kept clear of weeds ; after this they should be treated exactly in the manner of the sloe or black thorn plant, and planted with the quick on the bank in making of the hedge ; where they will grow up with the rest. One plant of buckthorn may be set at every fifteenth of quick.

The stem will grow to the common bigness of the hedge wood, and when cut in the plaistering and the hedge, will answer the usual purposes ; and in the mean time every year there

there will be a great quantity of the berries which sell at a considerable price. The apothecaries buy them to make a purging syrup.

C H A P. XLIX.

Of the alder.

THE alder has been mentioned as useful for defending a mellow shore from the stream of a river: but we are here to enquire more at large into its nature.

The black alder, whose berries are mixed among those of buckthorn at the markets, is a little shrub no way allied to the right alder, except in the shape of the leaf.

The alder is as commonly raised a very large shrub, consisting of a number of tall and thick shoots rising from one stump; but it may be raised singly, and in form of a tree; and will so acquire a very considerable bigness. The bark is smooth, and of a purplish brown; the leaves are large, roundish and clammy: the flower is in a catkin in the manner of the hazel; and the fruit is a small light cone produced on a different part of the tree, and seldom much regarded.

The proper soil for the alder is a rich black mould in a flat near the edge of a river: it thrives particularly where the water every now and then floats the ground, and lies some time upon it. The little rivers of Buckinghamshire and Hertfordshire, that run through rich meadows, have a large quantity of fine alders upon their banks; and where they overflow frequently, new trees rise from the spreading roots of the adjoining ones in great abundance.

The great benefit of this tree is, that it will live and thrive in such places as will not agree with any other kinds. If such grounds were universally planted with alder, it would be of great benefit to the owners, as there is a constant demand for the timber, though at a small price.

The propagation of the alder is extremely easy, for the raising it in the usual manner in clumps of poles; but more care is requir'd in propagating it for a tree.

The alder will rise from sowing the little cone or fruit, but this is a tedious way. The common method is to cut the poles into truncheons of a yard long, and set these in the ground in a rich wet earth. They will grow as readily as the willow; and send up a great many shoots, which is the common intention in the planting them.

The truncheons are to be planted in the beginning of April. Some cut them immediately for that purpose ; others in October, tying them in bundles, and leaving them with the larger end in water all winter, and then planting them in spring. This they do to make sure of their growing, but it is an unnecessary trouble : they generally strike root very freely ; and if there be any doubt, 'tis but planting some spare ones, and those which do not take may be pulled up.

Another method is to plant a piece of the root of an alder deep in the mud crosswise, that a tree may rise from it. This deep laying in of the root secures it from injury by winds. Others bury a long pole of alder, cutting off both ends, and it will shoot up many branches, which are to be cut off near the ground, and then left to shoot many poles from each place where they were cut.

But though all these methods are used with some success, we shall advise a husbandman to a course quite different from them all ; which is, to raise the alder from layers, in the manner as described under the article elm. No tree whatsoever takes in this method more freely. The shoots rooting immediately, and bearing transplanting excellently.

The nursery for this purpose must be in some wet place by a river side, where a few stools of alder will afford a continual supply. A year after the laying, the shoots are to be taken off and transplanted. To this purpose let there be a number of holes dug at seven foot distance. These must be two foot deep : the young trees must be taken up carefully, and planted at least a foot and half deep upon some loose mould in the bottom of the hole, and the earth well put in about them. Every shoot will thus grow, and no method is so certain or so advantageous.

One year after they are planted let the owner go over them, and take notice which are the finest, strongest and straightest shoots ; these are to remain as they stand, but the weaker he is to cut down within six inches of the ground. The number to be left for trees should be about half, and the others will shoot up from the cutting in long and straight poles in the usual way. Thus he will have a parcel of alders rising up to trees, so far as their nature will bear, and another parcel of the usual kind, which are to be felled as common alders, while the others remain like the timber trees in a coppice, increasing in bigness and value,

lue, and standing throughout several cuttings of the smaller.

Alders in the common way, are to be cut once in four years.

The bark of this tree was at one time in use among the dyers for black, but at present is little regarded. While it was used to this purpose, the time of felling the alder was in spring, because the bark then came off easy. At present 'tis felled in November and December, and the wood is found of a greater firmness than it used to be when cut in the sap season.

It is proper to bark the larger and better pieces of the alder, tho' the bark be not used; for there breed worms under the bark which destroy the timber, but it is seldom hurt by them when that is off.

No tree grows quicker than the alder, nor does any of the soft wood kinds make a better return in profit: 'tis a wonder it should be any where neglected where there is ground fit for it. The farmer always finds purchasers at a better price for his old and large alders; therefore he should raise a quantity of trees to such a size.

The smaller poles make hurdles and gates; and of the larger pieces, chairs, country utensils, and clogs and shoe heels are made.

It bears to lie wet as well as any wood, but it must be always in water, for if it be sometimes dry and at other times wet, it perishes quickly. We read in old authors, that the alder was made the foundation of bridges, and buildings in boggy grounds: and it stands upon record that there is a great deal of alder used under our old bridge at London, and under the Rialto at Venice.

Some say alder hardens under water, till it becomes a kind of stone, but this is false. It will last a vast while on these occasions; and if a supply of large alder could be had for such works as are to remain under water, there would be a sufficient demand. This may be done on the methods here laid down.

The alder serves excellently for piles of all kinds; and faggots of this wood are good for laying in the trenches, cut through boggy grounds to prevent their filling up. The poles sell to the hop planters, and the small branches make good charcoal for gun powder.

The great consumption of the large and sound timber would be among the turners. It is a firm light wood, so that

that bowls, dishes, and the like made from it, would be preferable in that respect to those of beech, and smoother and handsomer than those of elm.

There is a toughness in sound alder that will make it bear turning very thin; and it is useful to the carver: answering freely to his chissel, and yet holding together in fine work.

A plantation of alder, beside the ease with which it is made; and its readiness to flourish where other trees will not grow, has this farther advantage, that the leaves and young shoots are so ill tasted, no creature will crop them.

I have named all these advantages, that more may be tempted to plant it than do at present.

CHAP. L.

Of the willow.

THIS is another of the watery trees, which, though frequent enough in some places, is not nearly so much cultivated as it might be; and which, under a better management, would yield great advantages.

The white willow grows to a considerable large and tall tree. The bark is pale, rough and cracked; the wood light and whitish: the leaves are long and narrow. The flowers are small, thready, and form'd into a kind of spike: the fruit grows on other trees of the same kind, and contains a downy seed.

There are several kinds of willow; but only a few of them are worth the husbandman's notice: the ozier and the fallow are properly of the willow kind, but these differing from the common in many respects, shall be treated of in separate chapters. Among the others the common tall willow, or white willow, which freely rises into a tree, is the principal in value. Next to this is the large leav'd green willow, which is generally kept a pollard. The others are inferior.

The proper soil of the willow is a damp rich earth; near waters, and in flat grounds. Of the two kinds, the white will do with least moisture: the green leav'd kind, which is best kept for shrowding, loves the wettest places. Let the farmer keep this in his remembrance: for on these careful distinctions, depends in a very great degree, the advantage of plantations.

The willow is easily propagated; for it will take root in
any

any form, and thrive wherever there is water. The white will thrive in clayey and loamy soils, and will often rise to a considerable stature in hedges, and waste grounds.

The common method of propagating the willow is by cutting poles of ten foot long: these are to be struck off one way at the bottom, and thrust two foot and a half deep into the ground. This is so easy and expeditious, that few will think of any other. None is better for the green willow, which is intended for a pollard, because a little advance in height gives it the proper length of trunk, and the shrowds naturally grow from the top. But for raising trees of the white willow, we prefer layers. These are procured with the greatest ease, as directed under the article elm, only chusing a wet piece of ground for the stools; and being afterwards planted in deep holes, as directed for the alder, they take firm root, and grow up with surprizing quickness. When these trees stand on a moderately dry soil, they rise to a sound and good timber, consisting of a large blea, and a redish heart, which is firm and beautiful, and bears a tolerable price.

The best time of planting the willow is the end of February: and if the common method by poles be used, it will be proper to let them stand with the end in water, that is to be thrust into the ground four or five days before they are planted. The distance should be about fifteen foot, and care must be taken not to rub up the bark in thrusting the stake into the ground.

The green willow in the pollard form, is of so quick growth, that it may be cut once in four years. The season is November or February, and one is as well as the other. But as this tree is of such speedy growth, it is also of quick decay.

Pollard willows should never stand longer than five and twenty years: a fresh supply should be raised against that time, by planting new stakes between; and the old ones should then be grub'd up while their trunk is sound; for soon after that time, and often before, it grows hollow, and moulders away into a kind of touch-wood.

The mischief begins at the top, where the wet gets in after cutting off the shrowds, and thence penetrates all the way down.

Pollard trees of this kind must be carried to a height above the reach of cattle, before they are suffer'd to shoot for a head.

When

When the white willow is raised for a tree, the usual care is to be taken in trimming it up, to let no large side branches shoot; and to leave a few small ones to bring up and detain the sap in the trunk: by this means it will rise to a tall and well looking tree.

This kind may also be cut for shrowding, and either is of great use this way in places where fuel is scarce, for they yield a great quantity, and a quick return. A person who has but a moderate number, by allotting them into four divisions, and cutting one part every year, may have an annual supply.

The willow is of great use also in hedges in proper soils. The stakes being made of this wood, will all grow, and at once continue firm, and thicken the hedge.

The wood answers the purposes of the alder, and many others; the poles make hurdles and fences, and withs for the tying up of faggots. They are used by the thatchers instead of hazel; and they burn into an excellent light charcoal. An acre of ground will at eleven years growth yield a hundred load of this wood. The large wood is used by the turners, and when good, brings a considerable price. The worst may be split out into billeting, and it burns excellently.

When the willow is raised in a tree, and has a long and sound trunk, it may be cut into boards, and used in building, for they are strong, of a good grain, and very beautiful.

C H A P. LI.

Of the ozier.

THE ozier is a small willow. From the uses for which it is raised, it requires a different management.

It resembles the willow in appearance, but that is smaller, its shoots are longer and slenderer, and its leaves also longer; these are narrow, and in the best kind green on the upper side, but whitish, and woolly underneath.

The ozier loves a wet and low ground, near waters. It thrives best in marshy places, near the edges of large rivers; or in those little islands that are form'd by the breaking of their current; and every way surrounded by the water. The ground for an ozier bed should be a rich black mould; and this is very common in these low and wet situations.

The

The design in planting the ozier is, that it may shoot out a great quantity of fine slender twigs, to be cut at a small growth. There is no occasion for a trunk either of the pollard or timber form. This would only exhaust a great deal of the nourishment, and deprive the shoots of it; neither are they so apt to rise strait and fine, unless they begin near the ground.

The ozier is raised as the other willows, by truncheons or stakes driven into the ground; and it is proper always to let a certain quantity of the shoots stand for a due growth for this purpose, when the rest are cut. As these are not to rise in a trunk, they must not be above four foot in length, and three foot of this must be thrust into the ground.

They will thus have a fine supply of roots; and beginning to shoot so near the earth, all the nourishment will be carried up into the twigs.

The stakes are to be planted at three foot distance: the twigs rise from their tops; and being cut down pretty close, in the manner of throwing pollard trees, they send up a new set of twigs again almost immediately, which soon grow to their proper size.

The time of cutting oziers is in September. Many waste pieces of wet ground might yield a great profit by them.

If stakes of proper bigness cannot be had, more time will be requir'd to raise the ozier bed; but it may be done from smaller sets. These are to be cut four or five foot long, and stuck at the same distances into the ground. They will grow freely; and after three years they are to be cut down, within a foot of the earth, from thence will rise the twigs in great abundance; and they will continue affording a supply of them many years.

The finest and best ozier is that with long leaves, white underneath; but there are several others that answer the purpose. The twigs are of constant and ready sale. The basket-maker's work depends upon them; and there is a great consumption among fishermen. The wheels, as they are called, for catching eels and other fish, are made of them: and baskets, hampers, and the like, of which the demand is, in a manner, endless and unlimited.

The quick growth of the twigs is a great article in the profit of an ozier holt, for they are cut every year; and the heads that bear them grow for a long time more and more bushy after every cutting. A vast profit is made with

scarce any expence; annually returned and increased every year; and this upon ground fit for nothing else; for the ozier will grow and flourish on ground that is so loose and wet, that it would not afford hold for the root of any other kind of plantation.

As the stems of the ozier will decay in time, let the husbandman take care to have a supply. Nothing is so easy: for 'tis only sticking into the ground some twigs between the stems, which will take their time to root themselves, and grow to a due bigness; and when properly cut, will be ready to yield their produce as the old ones begin to decay.

CHAP. LII.

Of the fallow.

THE fallow is properly a kind of willow, but so far different in its cultivation and use, that it properly falls under a distinct consideration.

There are several kinds; and all answer the same purposes: but the kind of fallow which will best answer the farmers care is that with a roundish leaf, of a pale green colour and rough. This is common in hedges, and it is from this, he should raise his stock.

The proper soil is a rich black earth, where there is some moisture: its most favourable situation is in the damp part of a coppice, or in a hedge row in a flat meadow, where there is a wet ditch at the bottom.

In these places the fallow rises to most perfection, but it is not confined to these: it will grow in loamy or clayey soils far from water, and in almost any situation.

The advantage of planting it in its most favourable soil is, that it grows quick. It is an excellent shrub to mix with white thorn in hedges, and in this case it will be fit for cutting every four years; so that it yields doubly the wood of any other kind in a fence; and at the same time improves and strengthens it.

The fallow may be propagated as the willow and ozier, by sticking stakes into the ground: but when it is set in a hedge, the best method is to plant the sets with the white thorn.

They should be planted on the opposite side of the bank from the white thorn of the hedge; because they will be fit to cut before the white thorn is half grown.

If

If sets are not in readiness, pieces of fallow twigs of a yard long, and an inch thick, may be let into the bank slope-wise, at proper distances. The best method is to make an hole with an iron crow, for if the fallow stake be thrust in of itself, the bark is often injured.

Chalk and sand are soils on which the fallow will not thrive. A loamy earth in the neighbourhood of water, will make it push at a great rate: faster indeed than in pure mould, because of the warmth and the free passage of the water; but the wood is firmer when it grows on a good mould.

The best time for cutting this shrub is early in spring; and it then shoots out almost instantly. The husbandman should use some care in the manner of doing it. It is a common complaint that fallow stumps are not lasting: if this were true the objection would not be of great force, they are so easily supplied; but it is the careless manner of cutting, that makes them decay. If the shoots be ill cut, their ends left long and straggling, and haggled by a clumsy workman, they will let in wet and decay the stumps: but let them be cut off close and smooth, and at a proper season, and the fallow shall last as long as the thorn.

The quantity of wood produced by the fallow is of great advantage to the farmer, for he always has it ready to make up, thicken and mend his fences. The poles are used for hurdles, and when they are larger they turn to better account in making rails, and rafters.

We propos'd to raise the alder into a timber tree, and the same may be done with the fallow.

Though we usually see it a low shrub, it may be rais'd from layers, as the alder, and train'd into a regular well-bodied tree. In the damp parts of the woods it will grow among the other timber. And plants of it thus rais'd, may be left standards in the felling of coppices, while those that grow in the usual way are cut with the rest.

This way it affords a firm and tough wood, that splits easily with the grain, and may be used on many occasions in country building.

The heart of fallow, when rais'd into a tree, is red, and very firm: 'tis said, if kept dry it will last as long as the oak, and I have seen trees from which very large beams of it might have been cut; some of them being fifty foot high, and of a good thickness.

No shrub requires more care to defend it from cattle than

than this, in the common way of raising: for the young shoots are sweet. The value of the wood, in this way, consists in the length and straitness of the poles, which will often grow to ten or twelve foot: they will naturally rise to this if uninjur'd, but the cattles biting off the tops makes them bushy, short, and irregular.

It is best for the root to cut the fallow poles in spring, but it is for the advantage of the wood to cut it in winter. Therefore when the poles are large, and likely to bring a price from the turner and joiner, they should be cut in November; but when they are small, and design'd for fire wood, or repairing of fences, it is best in spring.

One advantage the fallow has over other shrubs, whether in an hedge or coppice, is, the ease wherewith it thickens them where there are vacancies by laying down. A pole of fallow of ten foot long, may be brought to the ground by a chop almost through, at the bottom, and laid in a small trench opened for that purpose: in this let it be peg'd down, and cover'd with mould; and there will rise a forest of fallows from it; as many of which may be suffered to grow as are needful.

In most places where there are fallows, the ground seems to produce young trees of the same kind, as it were of itself, often at a considerable distance from the old ones. These rise from the seed; they may be taken up, and train'd to good trees: but the method by layers is equally certain.

C H A P. LIII.

Of the fir tree.

THE fir is not native of this country, but which may be propagated here with great advantage. Its uses are sufficiently known; and every husbandman must wish he had it in his power to raise it. How far that may be done profitably shall be shewn.

The fir is an ever-green; tall, stately, and of an extremely regular growth. The bark is of a pale reddish brown, rough and crack'd: the leaves are small, slender, and grow in vast abundance on every part of the branches: the flower is a kind of catkin, and the fruit grows on a different part of a tree. It is oblong, hard, and scaly, and is called a fir cone, and by the vulgar a pine apple.

There are several kinds of fir; and many of them have
been

been brought into our curious gardens : but the husbandman who would plant firs must chuse that kind which is called the Norway fir, or spruce fir, which is the sort that affords the fine deals we have from that country. This is called by authors the common fir, or the pitch tree ; and is distinguished from the others by the smallness of the leaf, and by the fruit hanging down.

There are two or three other very hardy kinds which have been long cultivated in some parts of England, and may be worth notice, but this is the standard and principal sort.

The first of these others is the Cornish fir. The leaves grow like those of the yew tree. and the fruit is very long and hangs down. This was originally an American tree, but some of them planted, many years since, in Cornwall and Devonshire, still live and thrive there exceedingly.

The others are the small con'd fir, and the short leav'd fir, both these came also from America, but there are many trees of them in Devonshire and Cornwall, where they were long since planted, and have grown to a great size. There are some other kinds that will bear our climate : but the first named species is most immediately to the planter's purpose.

He may mix some of the others among that species, to see the different success, as this kind of planting is but new in England, with a view to use. Perhaps in some places one of the American firs may succeed where the Norway kind would not ; in that case it will be right to raise such, and try their value at the market.

The best soil for fir trees is a poor, stony, or gravelly land, where there is clay at the bottom ; and their most favourable situation is on the tops and sides of hills. This would be a sufficient reason for cultivating them in England, because a great deal of such ground is waste with us, though we shall shew no inch of land need be left waste, except by the carelessness of the owner.

Though a stony soil with a clay bottom be best for fir trees, it is not the only kind in which they will thrive. Firs of vast bulk grow in Norway and in North America, on cold clay, and in lower situations : on chalky hills also it thrives excellently. It does not succeed in loose sandy soils, nor in the rich mellow earth, where there is little or no admixture, but in almost any other it will succeed.

There are several plantations of them in different coun-

ties, where they grow well on various soils; but by examining the ground, I have found that they succeed best where there is a clay at the bottom; and where they stand open.

Nature produces them on cold rocky mountains: we see by the examples already cited, it is a tree which will grow in this country; we have enough of these rocky hills of little value, we should try whether this tree may not be planted upon them to advantage.

The fir is to be raised from seed.

Let the fruit, or cones, be gather'd when perfectly ripe, from a large and well growing tree: and spread upon the floor of a dry airy room. There let them lie all winter.

In the first week of March prepare the ground for them by plowing two or three times.

Then let a spot of two foot wide be broke and levelled with a spade at every ten foot distance; and let the seeds be got out of the fruit, that have lain the winter drying. They must be thrown into a large tub of river water over night, and taken out in the morning; their cells will then readily open, and the seeds may be taken out.

On each spot of the earth levelled by the spade, let there be sown half a dozen good seeds. Let them be cover'd an inch with mould; and a little piece of a furze be laid over them. This will keep the birds off; and will also make the ground a little moist, which will promote their shooting.

When the young trees appear, the furze bush is to be taken off, and with two or three others is to be stuck in the ground round about each spot; this will serve to keep off the sun and winds, as well as other enemies to young plantations.

Three or four plants will rise in each spot. When they are at a little height, the earth should be drawn up about the stems, and thus they are to remain three years, laying some loose stuff about them, to keep the ground moist and warm.

At three years growth all the plants of each spot are to be taken up, except one: the fairest and strongest is to be left, and care must be taken not to disturb its roots in raising up the others, and to settle the earth about it when they are gone.

Those which are taken up may be planted in other ground;

ground; and the single vigorous and thriving ones left in their proper places, will then grow up apace into a beautiful plantation. Their nearness will prevent their spreading into a great quantity of side branches; they will run up in height, and with a little care form a beautiful plantation of evergreens: a great ornament to the place.

Some litter should be strew'd about the roots to keep the ground moist. If water be necessary, it must be given in small quantities.

Firs may be thus raised, and will flourish without farther care, on chalky or stony soils; and on clayey that are not too wet; and best of all upon those hills where the husbandman finds it difficult to make any useful growth thrive.

They will be a great beauty to the country; and the profits cannot fail to be very great.

They seem slow in their growth while young: but let not that dishearten the planter; for it is only during the first years. After six or seven seasons they shoot up at a great rate; fir trees in England have risen to sixty foot height, and a proportionable bulk in twenty years. At about thirty they will be fit for felling for the common uses, and if the fairest trees be suffer'd to stand ten or twelve years longer, they will answer the purpose of the navy, or any other that require large and fine deals.

One would most wish to see these plantations made about the coasts, where the demand would be always great for the timber; but in every place deal is so useful, that it could never want a market. We might raise these trees so as to supply masts to our vessels, and every other purpose for which so much of the timber is annually imported.

Deal is in a manner an universal wood in building. Our wainscots, floors, and other parts of the house are made of it; it is very lasting when kept dry, and 'tis no little advantage to the carver and the joiner, whose several purposes it excellently answers, that it takes glue particularly well. We hope some of those who have waste lands on a proper soil and situation will begin the plantation; and then the advantage will soon make it universal.

C H A P. LIV.

Of the pine tree.

THE reader will perhaps wonder that among the first fit to be raised in England, we have not named the Scotch fir. But the present chapter, and not the preceeding, is its proper place. The pines and firs differ by obvious characters; and the Scotch fir, as it is called, is truly of the pine kind.

The pine resembles the fir in many respects, but the distinction is this, the leaves of the fir are short, and grow singly from the branches; though in great quantities, and near one another; whereas those of the pine are long, and grow always two together out of a kind of sheath or case.

This is the distinction all authors have establish'd between the fir and the pine; and according to this it is evident, that what is called the Scotch fir, is one of the pines, and not of the fir kind. The name is only a vulgar error.

There are several kinds of pine rais'd in our nurseries; but those worth the husbandman's regard are principally three; the common pine, the wild pine, and that called the Scotch fir. They all bear cones resembling those of the fir, but the Scotch is distinguish'd from the rest by the smallness and whiteness of them. Its leaves also, though longer than those of the fir, are short in respect of others of the pine kind.

These three sorts delight in a stony or chalky soil, with an elevated situation. They will grow in the same places with the firs, and plantations of them might be made, with success, in many parts of England. We see them thrive very well in some places, where they have been raised within the last twenty years; and if they have failed in others, it is owing to the ignorance of those who undertook the business. Some soils will not suit them; and if they are against nature planted in these, they must perish, or at the best keep barely alive, without flourishing.

The same method of raising these trees is to be used as was described for the firs.

Beside their uses as timber, the vast quantity of pitch, tar, rosin and turpentine, which they yield, is of great consequence;

sequence ; of this there is a vast profit made in France, and many other kingdoms.

We have places fit to raise them, and the manner is very easy, and has been here laid down at large. There can be no doubt of such a plantation answering the expence and trouble, were there none of these advantages : but when it is found that they thrive here, and we have plenty of them of a proper growth, it will be worth while to try, whether these valuable articles of commerce, may not be procured from them here as well as elsewhere. The methods by which they are obtain'd are plain : they are deliver'd at large in many books ; and in case of difficulties, it would be easy to bring over workmen from the places where they are constantly made, to ensure the success. They cut through the bark of the pine trees in spring, and there runs a clear rosin in great quantities. They strain this, and the fine part is what we call common turpentine, of which there is a vast consumption among farriers, and many other trades. The coarse part is distilled with water, for oil of turpentine, and what remains in the still is common rosin. The pitch and tar are made by burning the wood in a close place : they cover it up while burning, and the juice which runs out in vast quantities is tar ; and when it is boiled up to a thickness it is pitch.

Nothing can be easier than all this. If one set of the products could not be obtain'd from the pine trees raised in England, another might : if there could be a difficulty about the rosin or turpentine, there can be none about the tar and pitch. And they are of sufficient value to make it well worth a trial.

CHAP. LV.

Of the juniper.

AFTER these tall resinous trees, we are to introduce a low shrub, in some degree of their nature, and which is a native of our country ; the juniper. Perhaps this cannot be made to yield any very great profits ; but it naturally grows on our worst ground, and nothing can be more easy as to plant such places with it. There can be no doubt of its thriving there, and if there be among these grounds, any that cannot be put to a better use, it will be an advantage.

The juniper, although a small shrub in England, rises to

to a considerably large tree in some parts of Europe, and it would be best to raise it here from seeds of these trees, and see whether we could not get it to the same stature.

The bark is reddish, and smooth; the leaves are small and narrow, of a fine bright green, and prickly. The flowers are small and inconsiderable; the fruit is a round berry: it grows on a different part of the tree from the flower, and is soft and pulpy, with three seeds within.

The natural soil is a loose, and sandy earth, it will grow on this though very barren; and will bear any exposure; but it succeeds best where there is a firm bed under the soil.

The berry shoots quickly; and with a little care will be soon out of the way of any accident.

The berries being gather'd from the large tree junipers abroad, and carefully sent over, the ground should be broken with two good plowings; and in the beginning of March, the berries sown pretty thick, harrowing them in. They will lie in the earth till the next spring; when they appear, it will be of great use to sprinkle some furze bushes over the ground, removing them as the plants grow up.

The following spring the plants should be thin'd, and left at about four foot distance; after this they may take their chance, for they are hardy enough to shift for themselves: only at the end of one year more, the planter should go over his ground, and cut down about half of them within five inches of the earth, leaving the fairest and best growing plants entire. He will thus have a beautiful ever-green plantation, part shrub, part tree, and after a little time he may send people annually to gather the berries; which will be produced in great plenty, and will always bring a ready price from the distiller or druggist.

The wood of the juniper, when it grows to any size, is of considerable value. It is yellow, of a fine close grain, and extremely tough. It has a fragrant smell, in some degree resembling that of cedar: from this many have been led to call the junipers of different parts of the world, cedars. The Virginian cedar, the Bermudas cedar, and the like, being really junipers.

The juniper wood is excellent for turning, carving, and many of the finer and more delicate uses. When large enough, its grain is so beautiful, as well as its colour, that

the cabinet-makers would be ready to purchase it at a good price.

Upon the whole; the cultivation is so easy, and the ground on which it would grow so cheap, that it must be very well worth while to try the raising it to a considerable value: of this there is a very fair prospect, since there is a certainty of its sufficiently answering the expence and trouble.

C H A P. LVI.

Of the yew tree.

THE yew is a tree of less frequent use than the generality of those we have spoken of; but it will grow in places where those of more value cannot find nourishment, and is therefore very well worth the notice of the husbandman.

It is an evergreen; and when suffered to grow at large in a favourable soil, will arise to a considerable height, and a proportion'd bulk of body. The bark is of a reddish colour, as is also the wood: the leaves are of a blackish green: the flowers are small and inconsiderable, and the berry stands in a red juicy cup.

The use of the yew in gardens is well known. Though we no longer cut it into peacocks and giants, it is in credit for hedges which are thick, and an excellent defence: the husbandman is to consider it only as it may answer his purpose in the fields where it is to stand for timber.

We find the yew tree wild on our most barren hills in Suffex and Hampshire; and in such places it may be worth while to multiply it; for it will thrive in the poorest soils; and on the most exposed places; and after standing a sufficient time, for it is a slow grower, it will yield a very considerable profit.

The practice of our nurserymen is to raise the yew in small beds from the seed, whence they remove it at two years old to greater distances; and thence, after three or four years more, they transplant it into the gardens: but the husbandman is not to be guided by the nursery in his raising of trees. He is to make his plantations on bad soils, and he must raise his trees on the spot.

Let him gather yew berries when ripe, from large and tall trees; and open the ground at every six or seven foot, where he intends his plantations.

In each of these holes he must sow eight or ten of the berries, with the red juicy part about them; and throwing a piece of furze bush over, he is to leave them to take their chance. They will rise freely, and all he will have to do afterward is to pull up the least promising, till only one plant is left in each place. These he should go over every spring, trimming off the side branches, and training them up for a single trunk.

The yew particularly wants this care, for it is apt to spread and branch out from the lowest parts of the trunk. It is owing to this, that we so rarely see a piece of tolerably large yew timber. Here and there an old tree, that has stood in a church-yard, takes its own course into a tolerable trunk; boys cutting off its lower branches. Otherwise we rarely meet with it, and never in the perfection that it might be brought to with due care.

The wood of the yew tree is firm and beautiful: it is veined with great elegance, and is capable of a fine polish. Bows were, in old time, made of it: at present it sometimes supplies the place of *lignum vitæ* in bowls; and it is greatly admired in whatever form 'tis met with.

Where large trees of it have been cut down, people upon the spot have, in curiosity, had tables or other pieces of furniture made of it, and they have always been admired.

The uses of this timber are little known; but if it were any where so raised that it could be had in plenty, and of a good size, uses enough would be found for it. The more irregular pieces might be employed by the wheel-wright and mill-wright, and would make posts, and many of the country utensils; and the regular and even parts would bear a price with the cabinet-maker and turner; being superior, in all respects, to a great many kinds which they constantly use, and which they buy at a large price.

CHAP. LVII.

Of the box.

WE treat here of trees of much less value than those named in the first chapters, but they are such as have their use, and may be worth the husbandman's notice.

Box is a very little tree, its bark is yellowish, its wood firm, and also yellow: the leaves are roundish, of a dark green, and continue all the winter: the flowers are small and

and inconsiderable, the fruit grows on another part, and is divided into three portions, containing two seeds in each division.

We distinguish two kinds of box, a dwarf sort that is set round borders, and one that is taller, called the tree box. This last is the only kind worth the husbandman's notice. Beside these two, there is a narrow-leav'd species; but its timber is not so fine as that of the common sort.

Box loves a poor soil, and a bleak exposure. It will grow upon the worst of our lands, whether stony, chalky, or of whatever kind.

The common way of propagating it is from cuttings, but this is not the method for the husbandman who would have this tree on his barren grounds.

He may raise it from seed, and that must be done upon the spot, in the same manner as has been directed for the yew; or he may plant it from layers as the elm. These take root freely enough. If the ground have any richness, this is the best method; but where that is very poor the way from seed is to be prefer'd.

Which ever way they are rais'd, he must go over his young plantations once a year, to take off the large side shoots, and train his young trees to a trunk. They will thus rise to an height and bigness, of which those would have no imagination who had not seen them where they grow freely, as on Boxhill in Kent, and some other places; but in these they do not arrive at that height and value they will do when train'd for it from the beginning.

The wood, when of any size, is of great value; and when rais'd to the bigness and regularity that it would attain by these methods, few know the price it would bring. It is the heaviest of all English woods, and one of the firmest and hardest: its colour is very beautiful, and the grain fine. It is used for the making of mathematical instruments, and other things that require strength and firmness in a small body, as combs and the like. The turner is glad of it on many occasions; and would be on many more if he could have it of a size for his larger works; this would easily be brought about, by the proper training it up, and giving it time for the growth into a well-bodied and regular tree.

C H A P. LVIII.

Of the cypress tree.

THIS is another tree, which, though at present confin'd in a manner to the garden, might be brought in to the fields with advantage.

It is an handsome tree, and when the right kind is planted, arrives at a considerable size. The leaves are flat and scaly; the bark is uneven and brown; the flowers are small and inconsiderable; the fruit grows on other parts of the tree, and is roundish, hard, and woody: it cracks when it is ripe, and contains in its different divisions several hard seeds.

There are two kinds of cypress, one which grows up erect, and the other which spreads its branches. The second, which is known by the name of the spreading or the male cypress tree, is to be prefer'd. There is another very unlike them, except in the fruit: it is brought from America, and loses its leaves in the winter, whereas the others are green all the year, but this is not worth the husbandman's notice.

The right soil for the cypress is a warm gravel: it will grow on sandy grounds, but it does not thrive so well as in the other, among which there is usually a mixture of loamy or marly earth.

It succeeds best in an elevated situation, but should not be planted on entirely exposed places; on the side of an hill, where there are springs at a moderate depth, and where there is the defence of hedges or trees, it will thrive excellently. There are many pieces of ground of this kind, on which nothing of any value grows, which would carry up the male cypress to great value.

It is one of those trees so utterly neglected here, that 'tis hard to say what is its value; but the esteem in which its timber is held in other countries, and the value that was set upon it in earlier ages, shew very plainly that 'tis not without a title to the husbandman's care.

The cypress is to be propagated by sowing the seeds: the first care should be to get them good, which cannot easily be done in England; for though these trees bear fruit with us, it does not ripen perfectly.

The planter of cypress therefore should procure some well

well ripen'd fruit from Italy, and sow the seeds with due care.

The fruit is to be laid at a distance before the fire, till warm through, upon which the cells will begin to open, and the seeds may easily be pick'd out.

These are to be sown in the middle of March, upon the ground where they are to stand, spots being dug and prepar'd at eight foot distance for that purpose.

Ten or a dozen seeds are to be sown in each spot, and when they are come up, and have advanced a little in growth, the young plants are to be pull'd up, till only the one most flourishing shoot be left in each spot. These are to be train'd up for timber, by cutting off the spreading branches with moderation; for the tree naturally spreads, and too much violence must not be done to that general and natural form.

Little care is requir'd after the trees are established, but they take time; for the cypress is not one of the quick growers.

The timber of the cypress is of great value, its texture is close, and 'tis of a fine grain. It is excellent for chests for keeping of cloaths, moths never coming near it; and no wood whatsoever is more durable, perhaps none so much. It was antiently a custom to bury in cypress coffins. The wood is plainly excellent for many uses, and there only wants a supply of it. The turner, the cabinet-maker, and the joiner would soon find employment for it, for it is greatly preferable to many of the foreign woods. The worst pieces would be fit for all the common occasions, in which strength and durability were requir'd, for it will stand wet or dry beyond almost any other wood.

C H A P. LIX.

Of the cedar.

THE cedar, though rais'd here only as an ornament to gardens, might be cultivated for the value of its timber.

Several trees are called cedars, which are of the juniper kind, bearing berries; and most of them rising but to small heights: but by the cedar is here meant that large beautiful and spreading tree, which is commonly known in England by the name of cedar of Lebanon.

This is a large and stately tree, with spreading branches,
standing

standing out almost flat from the trunk, and often drooping. The bark is rough and of a reddish brown, the leaves are narrow, and grow many together in a tuft, so as to resemble a pencil: the flowers are a kind of catkins: the fruit grows on another part of the tree, and is a large and beautiful cone.

The natural soil and situation of the cedar are stony and mountainous, it thrives in the coldest and bleakest exposures. The place where it once grew in great abundance, and whence it has, for many ages, had its name, gives proof of this: it stood in the most thriving condition, on those parts of mount Lebanon which are, in a manner, all rock, which are exposed without the least shelter, and where the snow lies to a considerable depth almost throughout the year.

We have barren, bleak, and rocky hills in England, on any of which it will grow, to which it will be a singular ornament, and where it will yield a very great profit to the owner. There is no soil so poor as to be too bad for it; and it will not thrive so well on such as is better. Sandy, gravelly, and stony ground, which will give nourishment to nothing else, support the cedar, and raise it, in a very moderate time, to a large and valuable tree. The trees in watery places are in general the quickest growers, but the cedar, though it love dry and barren soils, is far from slow.

But though this be the proper soil of the cedar, trees of it are seen flourishing in low grounds, and in soils absolutely boggy, in several parts of the world: In these they grow slowly and irregularly; and their timber has not its true fragrance or beauty; nor its proper firmness.

The cedar is to be rais'd from seed, on the places where it is to stand; for the proper soils are so poor, that a plant removed into them from any other would have an ill chance to thrive.

The cones are to be had from abroad. There are many of them brought every year from the Levant, and to be had in London. An iron spike must be driven thro' the cone lengthwise; this separates its parts, and forces out the seeds so, that they may be pick'd out with the fingers.

These are to be sown early in the spring, six or eight on each spot where a tree is intended to stand, and these spots should be prepared at five and thirty foot distance.

A

A piece of furze bush should be laid over the place; and kept there till the young plants are of some strength. Then they are all to be taken up, except one, leaving the fairest and most thriving; and to train this up strait a pole must be set in the ground near it, and the leading shoot gently ty'd to this as it grows. This is particularly necessary to the cedar, for it is apt to incline to one side in growing.

The young trees thus secur'd for straitness may be left to nature. They will grow slowly at first; but soon after they have arriv'd at a good fixture in the ground, they make amends for it, by a speedy shooting: they are not to be train'd for height in the usual manner, by cutting off the side branches: for the lopping of all resinous trees is prejudicial. Therefore when it is thus carried strait in the leading shoot, by tying it up, the rest are to be left to nature; and although a great many large and spreading branches are formed on every side, the trunk will be sufficiently nourished, and will rise to an height and thickness, to yield timber fit for all the purposes to which such wood can be used.

It is singular, that as the worst soils, so the hardest seasons agree better with this tree, than such as are richer or milder. The cedar does not always ripen its fruit with us, but a hard winter is always found to promote this.

This may be a farther inducement to our husbandmen and owners of bleak, barren, and exposed land, to plant the cedar on it, for where a tree ripens its fruit preferably to other places, there doubtless it will be more certain and secure to succeed in a plantation.

The size to which the cedar will grow, is very considerable. We find in Maundrell's travels, that there are at this time on mount Lebanon, cedars that appear to be quite sound, and are between thirty and forty foot in circumference in the trunk; if we could raise them to any thing like this in England, the value they would have is easily known.

The wood is of a redish colour, and of a fragrant smell. It is sufficiently firm; but liable to split: care therefore is to be taken in the working it; but when wrought it endures for ever. This is its great quality; and while it remains entire itself, it preserves also what is kept in the chests made of it; no moth or mischievous insect ever coming into them. We read in the old authors, astonishing accounts of the duration of this wood; and by many

certain instances are led to put more faith in those relations, than it would be natural to do without experience.

The size to which we read of these trees growing is also countenanced by what we see at present. A man would start at the account of a cedar eighteen foot in diameter, and a hundred and thirty in length, had he not read of that just mentioned by Maundrell, and which is to be seen by the curious at this hour.

There is no doubt but this tree may be rais'd in England in any quantity; nor can there be any question of a demand for the timber, and that at a very considerable price, as soon as it should be regularly brought to market.

It may not be improper to conclude the present part of our work with this short observation; that in many cases timber is preferable to any other growth, even upon land that will bear any thing; but in general, the great advantage to be made from it, will arise from the propagating it in places where other things will not grow, or in spots where they cannot conveniently be raised.

The several kinds of timber trees have been here treated of at large, and the person who intends to plant, should first go through the account of them; that he may be able to suit the growth to the nature of his soil, and the situation of the land.

There is no soil whatsoever, on which some kind of tree will not grow; nor any exposure which some will not bear; but the great article of knowledge consists in exactly knowing the different value of each tree, and the different kinds that each land will bear.

In those soils and situations whereon any kinds of the common valuable timber trees will grow, there are some which succeed better than others; and in order to make the greatest advantage from a plantation, this should be known. In the same manner, even on the worst there are generally two or three that will succeed, let him therefore have all these in his eye when he is about to begin a plantation; and considering thoroughly their several advantages, and the circumstances of the ground, let him chuse that which will be most sure of success, and bring the greatest profit.



End of the FIRST VOLUME.



